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VOLUMES 1-5

1934-1938

EDITED BY

HAMILTON P. TRAUB

ORLANDO, FLORIDA

THE AMERICAN AMARYLLIS SOCIETY

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ERRATA

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[HERBERTIA, VOL. 1, 1934]

- Page 15; line 21 from bottom, for "Alexander" read "Arthington."
- Page 47; second column, line 28, for "*Daones*" read "*Doanes*."
- Page 61; line 25 from bottom, for "of" read "or."
- Page 82; line 11 from bottom, for "Wlliam" read "William."
- Page 87; line 11 from bottom, after the words "They should" insert
the word "not."

YEAR BOOK AMERICAN AMARYLLIS SOCIETY, 1935

[HERBERTIA, VOL. 2, 1935]

- Page 85; second column, line 7 from top, for "*entrerrian*" read
"*entrerriana*."
- Page 112; line 11 from bottom, for "formation" read "information."

HERBERTIA, VOL. 3, 1936

- Page 68; under "Ammocharis," the 3rd. species, for "*Traveliana*"
read "*Taveliana*."
- Page 96; add legend "*Amaryllis reticulata* var. *striatifolia*" at bottom
of Plate.

HERBERTIA, VOL. 4, 1937

- Page 22; delete "azaleas, camellias" at the beginning of 15th. line
from top (text).
- Page 24; 2nd. column of table, 9th. entry from top, for "*C. angustifol-*
ium" read "*C. angustifolium*."
- Page 63; 3rd. line from top, for "*Institute*" read "*Institution*."
- Page 63; 13th. line from top (text), for "are" read "is."

- Page 63; 14th. line from top (text), for "most" read "more."
- Page 64; 17th. line from bottom (text), for "immorality" read "immortality."
- Page 79; 2nd. and 3rd. lines from top (text), delete "illustrated in Plate 48."
- Page 157; Plate 66, credit line, for "Max Hoeber" read "Max Loebner."
- Page 161; 2nd. line from top (text), for "Plate 56" read "Plate 60."
- Page 177; 1st. line of table, following "GILLIESIAE" insert "0" under "No. of species," and insert "—" under "Basic. Chrom. no." and "Range (2n.)"
- Page 177; 7th. line of table, for "GILLIESIAE" read "GALANTHIAE," and delete "O" and two "—" following.
- Page 189; 2nd. line from top (text), for "seeding" read "seeing."
- Page 206; Plate 76, for Figs. "8a" and "8b" read "8" and "9" respectively.

HERBERTIA, VOL. 5, 1938

- Page 7; 10th. line from bottom, for "Sept. 7" read "Aug. 7."
- Page 16; 4th. line from bottom, delete "only."
- Page 18; 9th. line from top, after "his son" delete the rest of the sentence and read "and since that day he entrusted to him the leadership of the firm in full confidence."
- Page 21; 13th. line from bottom, delete "Most of them bear names given by the firm" and substitute "To most of them the firm's authority as raiser is added."
- Page 26; 7th. and 8th. lines from top, for "Duc van Tol" read "late."
- Page 39; 17th. line from top, for "autocracy" read "autarcy."
- Page 43; 4th. line from top; delete "try" and insert "conserve and."
- Page 82; 5th. line from top, for "amaryllis" read "amaryllids."
- Page 112; 10th. line from top, for "Andronecium" read "Androecium."
- Page 113; 17th. line from bottom, for "tepels" read "tepals."
- Page 115; 1st. and 2nd. lines from top, for "35" read "38" in each case. 5th. and 8th. lines from top, for "34" read "37" in each case.
- Page 118; last line bottom of page, change "28" before "*viridiflora*" to "27," and in place of "29. *tucumana*" read "30. *Haywardii*."
- Page 121; 14th. line from bottom, for "1943" read "1843." 15th. line from bottom, for "*vicolor*" read "*bicolor*."
- Page 123; 4th. line from top, for "Peoppig" read "Poeppig."
- Page 124; 24th. line from top, for "*ambigum*" read "*ambiquum*."
- Page 128; 26th. line from bottom, for "*equistris*" read "*equestris*." 29th. line from bottom, delete "Leopoldia."
- Page 131; 2nd. line from bottom, foot-note 2, for "*breviflora*" read "*reticulata*."
- Page 136; 5th. line of text from top, for "*Eurora*" read "*Europa*."
- Page 167; title at top of page, for "STENOPETATA" read "STENOPETALA." 17th. and 18th. lines from top, for "*stenopetata*" read "*stenopetala*."

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YEAR BOOK
AMERICAN
AMARYLLIS
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VOLUME I
IN MEMORIAM—
HENRY NEHRLING
1853-1929



1934

1934
FIRST NATIONAL AMARYLLIS SHOW
Sponsored by the
AMERICAN AMARYLLIS SOCIETY
In cooperation with the
ANNUAL ORLANDO AMARYLLIS FESTIVAL
At Orlando, Florida, April 3 to 4, 1934

Amarylleae blooms will be exhibited from the collections in various sections of the United States. Exhibitors living at a distance may show cut blooms if more convenient. Send exhibits directly to the Chairman who will give the same the best of attention.

For details see report of Exhibitions and Awards Committee or write to—

I. W. HEATON, Chairman
EXHIBITIONS AND AWARDS COMMITTEE,
1414 Ridgewood Ave., Orlando, Florida.

The 1935
NATIONAL AMARYLLIS SHOW
Sponsored by the
AMERICAN AMARYLLIS SOCIETY
will be held in
SOUTHERN CALIFORNIA

The place, dates and details will be arranged by a local committee, and final announcements will be made through the press.

For details write to
RICHARD DIENER
Southwest Regional Chairman
EXHIBITIONS AND AWARDS COMMITTEE
Oxnard, California

YEAR BOOK
AMERICAN
AMARYLLIS
SOCIETY

VOLUME I
IN MEMORIAM—
HENRY NEHRLING
1853-1929

1934

EDITORIAL COMMENT

Some correspondents have wondered why the period of economic readjustment was chosen for the launching of the American Amaryllis Society. As a matter of fact the event was probably in a great measure a coincidence since the interest in plants is only indirectly affected by economic upheavals. For over a hundred years, even before the days of William Herbert, there have lived men and women who have catered to the *Amarylleae*, and the stage was set for the organization of the Society even before the chain of recent events. Moreover, in this dawning age of planned, stabilized quality production, there is room for individuals to cultivate first rate avocations or hobbies. The particular field selected, whether it shall be stamp collecting, golfing, fishing, travel, plant collecting and breeding, etc., will depend upon the individual preference. The number of persons interested in *Amarylleae* is undoubtedly great enough to support a thriving organization—not the largest but surely a high quality association. Apparently no similar Society organized in this country was begun under such favorable auspices. The response was spontaneous and was not only confined to America but was world-wide. The roster of Charter Members speaks for itself.

And then, too, there was no room for failure with the availability of such willing and efficient workers as *Messrs. Hayward, Gebert, Duckworth, Ulrich, Wheeler, Heaton, Ainsley; Mesdames. Carter, Churchwell, McArthur*; and many others. It is a constant joy to work with *Mr. Hayward*, your Secretary, for instance. He is wrapped up entirely in his plant world. His brilliantly active mind encompasses the whole plant realm, but especially the *Amarylleae*. His enthusiasm is contagious and all should be warned to avoid him unless they wish to become plant enthusiasts.

The editorial policy of the Year Book is to publish timely articles but without too much formality. The Year Book will be at all times of, for and by the members of the Society. However, when necessary to establish fundamental facts, entirely technical papers will be published.

It is fitting and proper that the first issue of the Year Book be dedicated to the memory of the late *Henry Nehrling* who did so much to popularize *Amarylleae* culture in America. The portrait is typical of the man and will be appreciated by all. The *Nehrlingiana* by *Dr. Stone* and *Mr. Mead* give us at least in outline a word picture of his stature. *May he be remembered as long as Amarylleae bloom!*

It would be difficult to comment on all of the important papers in the Year Book. No attempt will be made in this direction excepting to point out some important problems treated, and to acknowledge a debt of gratitude to contributors from across the seas.

The two great needs at present center around a complete inventory of *Amarylleae* material, and a practicable method of vegetative propagation. These subjects have been duly emphasized. The reprinting of the *Genus Hippeastrum* from Baker's *Amaryllideae* is especially valuable to the members at this time, and the articles on propagation, although only a beginning will be welcomed by all.

Finally, we owe an especial debt of gratitude to our contributors in England, Holland and Japan. In England, *Mr. Worsley*, the Dean of the *Amarylleae* fraternity, has volunteered to make available his vast fund of information; the *Hon. Henry D. McLaren* has proved to be a genuine inspiration to us, and *Mr. Chittenden*, of the Royal Horticultural Society, has furnished much valuable information and assistance. In Holland, the venerated *Mr. E. H. Krelage*, a real *Amarylleae* enthusiast of many years standing, has volunteered his services, and *Mr. Ikeda*, in Japan, will keep the members informed on *Amarylleae* events in his country.

HAMILTON P. TRAUB,

Editor.

Orlando, Florida,
January 28, 1934.

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AMERICAN AMARYLLIS SOCIETY

In Memoriam—Henry Nehrling 1853-1929*

DR. WITMER STONE

The Academy of Natural Sciences of Philadelphia

On September 26, 1883, twenty-one ornithologists met in New York City to organize the American Ornithologists' Union. Two who had been prominent in the preliminary arrangements but who were unable to be present were enrolled among the founders and twenty-four additional Active Members were chosen from those known personally to the founders or from their published ornithological works. Among these was Henry Nehrling then living in the state of Missouri.

Of the Founders only five survive today and of the additional Active Members only six, so that in length of membership, Henry Nehrling with his forty-six years in the ranks of the A. O. U. stood close to the top of the list—a record of loyalty to our Society of which he might well have been proud, especially when we consider the few opportunities that he enjoyed of personal contact with his fellow members. Indeed so far as I can ascertain he attended but one meeting of the Union and while personally known to Dr. Merriam and probably to Mr. Ridgeway and others his visits to the ornithological centers of the East seem to have been few indeed.

Henry Nehrling was born of German-American parentage in the town of Herman, near Howard's Grove, Sheboygan County, Wisconsin, on May 9, 1853. His father was Carl Nehrling and his mother Elizabeth Ruge. His early education he received from his mother and grandfather and he was later sent to a Lutheran parochial school located several miles from his home. His daily walks winter and summer to and from school, through the then primeval forest, familiarized him with every aspect of nature and helped to develop the passionate love for the out-doors—the birds and flowers, that characterized his entire life. He soon learned the haunts of the wild things of the woods and fields—where the Wild Pigeons roosted, where the Grouse had its drumming log and where grew the rarer plants.

From 1869 to 1873 he attended the State Normal School at Addison, Illinois, and upon graduation became a teacher in the Lutheran schools, a position which he held until 1887, teaching at various places in Illinois, Missouri and Texas. It has been said, probably with much truth, that he looked upon his teaching mainly as an instrument by means of which he could carry on his studies of

* This article, and also the Portrait of Henry Nehrling, are reprinted by kind permission of the Author and Editor of the Auk. XLIX. 1932.

ornithology, and the changes from one locality to another added constantly to the breadth of his knowledge of bird life. During all this time he was accumulating data on the life-histories of North American birds and was publishing articles in popular magazines both in this country and in Germany, while a paper in the 'Bulletin of the Nuttall Club' presented his observations on the birds of parts of Texas about which comparatively little was known at that time. His studies of our native birds culminated with the appearance in 1889, of the first part of a pretentious work published simultaneously in German and English and dealing with the life histories of our familiar species. This work, a prospectus of which appeared in 1886, was apparently originally planned as a publication in German only, 'Die Nordamerikanische Vogelwelt,' but by the time of the appearance of the first part an English edition had been added under the title of 'North American Birds,' which when the twelve parts constituting Vol. I were completed (1893), was changed to 'Our Native Birds of Song and Beauty.' Volume II was completed in 1897. The author tells us that the work "is intended to fill the gap between the very expensive and the merely technical ornithological books," and "to combine accuracy and reliability of biography with a minimum of technical description." The need for such a work was deeply impressed upon him when, as a boy, he craved a book that would tell him about the birds he saw everywhere about him but a book that could be purchased with the limited means at his disposal.

Dr. Elliott Coues praised Nehrling's work very highly in his several reviews in 'The Auk' and concludes with congratulations on a "work which departs so widely from the average of its kind by making so near an approach to such as Audubon typifies."

That he succeeded in fulfilling the promise of his prospectus is evident to anyone who reads his volumes and they show how thoroughly he knew his birds and how deeply he appreciated the beauties of nature. Unfortunately Nehrling's work does not seem to be so generally known as it should be, possibly on account of a limited edition and lack of publicity. It is really an outstanding title in the literature of American ornithology and should be read by all who delight in pleasing descriptions of bird life and pen pictures of nature in her varied moods. Robert Ridgeway made paintings for some of the plates while others were by two German artists, Prof. A. Goering and Gustav Muetzel. The heavy paper with ornamental borders and the sumptuous gold lettered morocco binding are characteristic of the German style in such matters.

In 1887 Nehrling was made deputy collector and inspector of customs at the port of Milwaukee a position which he held until 1890 when he was appointed secretary and custodian of the Public Museum of Milwaukee, a post evidently much more to his liking. During his connection with the museum a former member of his staff states that "he made many important additions to the collections and laid the foundations for the future greatness and educational usefulness of this well known institution." Unfortunately owing to politics Nehrling lost his position in 1903 after twelve years of unselfish service.

As early as 1884 Mr. Nehrling had bought a tract of land at Gotha, Florida, not far from Orlando. He first visited it in 1886 and from that time seemed to have definitely fixed upon Florida as his future permanent home.

Thither, then, he moved in 1904 after a brief association with the Philadelphia Commercial Museum, an association notable particularly for the fact that the American Ornithologists' Union met in Philadelphia in the autumn of 1903

and Nehrling enjoyed the opportunity for the first time of attending a meeting of the Society of which he had been a member for so many years. It was during this period that I made his acquaintance and much of his time was spent in the bird room at the Academy of Natural Sciences studying the collection—a friendship developing which has always been one of the pleasant memories of my life.

While always a lover of flowers, even from his early boyhood, Nehrling apparently did not seriously take up horticulture until the time of his residence in Milwaukee where he built a greenhouse and devoted his spare time to the rearing of tropical plants, especially species of *Amaryllis* of which he produced many new horticultural varieties.

The exhibit of tropical plants at the Chicago Exposition was a great delight to him, especially the palms and *Caladiums*, and the cultivation and breeding of the latter became one of his hobbies when he removed to Florida. Here on his place at Gotha he developed a wonderful botanic garden and entered into correspondence with horticulturists in all parts of the world securing seeds of rare tropical species for raising and writing many articles on plant breeding for magazines and newspapers, as well as a volume on the *Amaryllis* which remained one of his favorite plants. In his experiments with the *Caladiums* he produced many new and beautiful varieties as a result of long and patient effort. It has been remarked that people are too prone to take the results of the horticulturists' work as a matter of course without any realization of the patience, industry and thought which go into the breeding of new varieties, and few probably realized the devotion of Nehrling to his hobby nor the extent of his knowledge of the subject.

Free to enjoy the practice of his favorite pastime and surrounded by the beauties of semitropical nature one might have thought Nehrling's life one of complete happiness but unfortunately, like many another gifted scientist, he lacked the business sense necessary for material success and absolutely honest himself took honesty for granted in others. The result was that he was often the victim of the unscrupulous and his life was frequently beset by financial difficulties. Indeed it is to worryment over these that the breakdown in health which resulted in his death is attributed. He died at Gotha, Fla., on November 22, 1929.

In consideration of his outstanding knowledge of horticulture, Nehrling had been appointed a collaborator in the Bureau of Plant Industry of the U. S. Department of Agriculture as early as 1906. At the Garden Club convention at Miami, in March 1929, he was awarded the Meyer Medal for distinguished service in his chosen field, a tribute that brought tears of gratitude to his eyes as in faltering tones he expressed his appreciation.

The life of Henry Nehrling was one wholly devoted to science but always to out-door science and contact with living things, rather than to the technical research of the closet naturalist. It was also pretty evenly divided between his two consuming interests—ornithology and horticulture and, to use the terms of the breeders of plants and animals, the former was the dominant factor in his earlier years and the latter in the closing period of his long and useful career.

From the wide circle of Mr. Nehrling's acquaintances one hears only the highest praise of his personal character. "Above all" writes Mr. A. H. Andrews, of Estero, Florida, "Dr. Nehrling was intensely human, being a man of genial and kindly disposition, as only a real lover of nature can be. A typical German

professor of the old school, of courtly manner and enthusiastically absorbed in his work, he made a host of warm friends and was as pleased as a child when visitors admired his garden."

Dr. David Fairchild writes me: "He was always a naturalist at heart,—reminding me of what I imagined Fritz Mueller of Blumenau, Brazil, was like. A plant savant—and how few others are left!—men who love plants with a passion that is delightful to see. His life was filled with financial worries but it had also a great deal of real pleasure in it for he was always playing with things he adored. His caladiums, his bromeliads, his palms, bamboos and ficus filled his days with a busy kind of pleasure."

Henry Nehrling's ornithological knowledge is already placed on permanent record in his 'Native Birds of Song and Beauty' and the publication of his contributions to horticulture, which we understand is contemplated would preserve for posterity the accomplishments in this field also, of the gentle, kindly scholar who labored so long and so successfully in interpreting nature and in adding to the knowledge and the pleasure of mankind.

HENRY NEHRLING AS I KNEW HIM*

THEODORE L. MEAD, *Florida.*

My friendly acquaintance with the late Henry Nehrling began almost forty years ago when he was still Custodian of the Milwaukee Museum although already interested in Gotha, Florida, property. Before 1893, our acquaintance had ripened into friendship and in return for a number of palms he sent me his fine illustrated quarto book, "Our Native Birds of Song and Beauty" issued in 1893 and containing friendly mention of his visits to my home and to the bird protection he found there.

Nehrling was always a most generous friend. Nothing gave him greater pleasure than sharing his botanical treasures with his friends, his acknowledgements of others' work in his field was always most generous and unstinted and he was the most modest of men in claiming recognition for his own attainments and wonderful success in collecting plant treasures. He was catholic in his botanical tastes with a keen sense of beauty of flower and foliage; his first desire was to obtain a beautiful plant, not selfishly, but to demonstrate and share its beauty with many others. Undoubtedly no plant lover that ever made him a visit was sent away empty handed.

But there are many men of many minds. Dr. Nehrling says, "Some years ago two friends of mine and I drove along the highway. It was October and the edges of the highways were a mass of golden flowers. One companion said, 'See the gold along the road. Isn't it wonderful!' I joined him in his admiration. The other, a business man, burst out with 'fools! "Gold along the road", Gold in your pockets is what counts, not gold along the road!' He intended to cut down two large dense and beautifully formed *Ficus aurea* trees that grew in the rear of the Hotel—It cost me much talking to save them".

In earlier days when there were no hampering quarantines, it was comparatively easy to acquire and test new and beautiful plants from all the world;

* An address by Theodore L. Mead, of Oviedo, at the Nehrling Commemoration Exercises in Rollins College, November 29th, 1931. Held under the auspices of the Quest Society of Florida, Lake Wales.

and every land and every clime added beauties to his collection at moderate expense and labor, but it is not recorded that any single injurious pest or insect was allowed to escape and become a menace to other property. Nor has any injury resulted from my own less extensive free importations from all the tropical countries of the world.

Nehrling told me that altho born in the United States, his home people spoke German in the family, and he did not know any English until after he was eleven years old. His ancestors were people of culture, familiar with German master-pieces and he himself wrote many valuable papers for publication in German periodicals. He is the author of a brochure, "Die Amaryllis oder Rittersterne (Hippeastrum)" published in Germany, which is a most comprehensive account of all the known species and hybrids of *Amaryllis* and also contains appreciative and enthusiastic accounts of magnificent gardens in Texas and Florida.

As long ago as 1917, Dr. Fairchild, himself a dean of botanical explorers, finds Nehrling's home the most interesting place in Florida.

In 1923, Nehrling writes from Naples,—“Letter and plants received—a most wonderful collection and the orchid carries a message I well understand I wish you were here, I need a kindred spirit in the neighborhood.”

“In spite of the mosquitos, I love this place. I love it although the soil is nothing but sea-sand, and you have to make your soil, every inch of it, but as long as I can get hold of mulch, it is not difficult to add humus to the soil.

“The six cycads that I brought with me from Gotha weighed over sixteen hundred pounds, they are at present extremely beautiful. So, you see I am not lonesome.

“I think if you would come down some day in your flivver, Mrs. Mead with you, you would find much in my garden to take along. You are welcome to anything you like to have. Bring a trailer along!

“So far, I have dug about five hundred holes 3 ft. deep and 5 ft. wide, and filled them with old grass sod, muck and compost. I have found that plants will grow only if thus treated. At Gotha no such treatment was necessary.”

In 1924 he writes,—“I am trying to obtain a lot of **Bromeliads** from our Botanical Gardens but the Directors are difficult to approach on account of quarantine regulations”. One of the quarantine officers remarked that Botanical Gardens are just breeding places for injurious insects, and naively inquired why Nehrling was not content with the offerings of the Florida commercial growers, ignoring the fact that he already had under observation probably ten times as many kinds of plants as all the commercial growers put together, and had not a tenth part of the plants that were necessary for his work.

Nehrling proceeds,—“There are a few large private collections of **Bromeliads** in Germany that could be obtained for a song, but quarantine regulations forbid I could get possession of such a collection containing over 500 species and 150 hybrids for \$200.00, but I have been turned down. They also turned me down when I tried to buy the whole Klissing collection of **Caladiums** containing all the best **Bleu, Bause, Hoffmann** and **Lietze** hybrids.”

Your beautiful **Billbergia** hybrids have given me again a terrible **Bromelia** fever. It is so intense that I have written lots of letters for new material—to Trinidad, Costa Rica, British Honduras and to specialists in Germany—there

were at least fifty of them in bygone years,—and to Holland, etc. . . . Carlos Wercherle discovered some most beautiful new species in the mountains of Costa Rica and sent me a consignment of 50 species, mostly new ones. They came as far as Jacksonville, but were returned to him by the agent of the Board and Wercherle could not be induced to send another lot even after I had sent him the special permits. In the Palmengarten in Frankfurt A/M, and at Kew they have fine collections of the most beautiful ones. A parcel containing some came as far as Jacksonville, but were sent back before I could protest. Dr. Lyons of Hawaii has a dozen or eighteen new kinds for me but they cannot come in. An old friend wrote me from Hong Kong that he will send me lots of **orchids** from Southern China but the importation to this country is hopeless. Dr. Purpus sent me some of the finest Mexican **Aechmeas** but I never received them. I could get lots of **orchids** from the Castleton Gardens but they will not be admitted. . . . I received a magnificent collection of epiphytic **Bromeliads** but so reeking with the fumes of hydrocyanic acid that unpacking them made me ill for the rest of the day. Every plant had been killed by the excessive fumigation. I am only allowed to import seeds and must have special permits for that.

“The edge of my swamp is lighted up with the innumerable flower trusses of **Ixora coccinea** and **I. lutea**. Yes, dear Mr. Mead, I am quite enthusiastic in spite of my late sickness. The only trouble is that I am getting old—feeling often like a **really** old man. And my correspondence is immense since I am writing for the **American Eagle** (Estero). The editor says this is missionary work, but even such work is sometimes a burden.”

In April, 1926, Nehrling writes,—“This was certainly a most eventful week for me. A box from the Brooklyn Botanical Garden and from the Missouri Botanical Garden, a package from a near-by friend, a box of rarities from the Garfield Park Conservatories, a box from Punta Gorda with bulbs of double blooming **Amaryllis** and your parcel with its most valuable contents.

“**Cattleyas** do best here and grow wonderfully well on the **Palmetto** trunks; one of your hybrids formed a large clump and had fifteen flower trusses and another has seven spikes of bloom. I could obtain many more but it is next to impossible to obtain permits, and then only for small plants—big ones are barred.

“Thank you very much for the flowering **Phyllostachys aurea**. I had never seen a Bamboo flower, they do not bloom until past 40 years of age. I feel quite elated over your opinion of my Bamboo Essay in the **American Eagle**—it was written with much love and enthusiasm.

“My tropical plant collection grows almost daily—tho’ we have had no frost, a few delicate plants were chilled, but **Crotons**, **Pandanus** (11 species), **Ficus** (40 species), **Palms** (about 100 species), **Cycads** (8 species) did not find the winter too cold”.

Later in 1926 he writes,—“I am extremely sad tonight. A shiftless cracker lives about a mile north of here and his kids set the woods on fire. It made its way southward with tremendous fury, burned several groves that had been mulched and then came towards my place. No power on earth could stop it, tho’ I and my boy and several men from the neighborhood worked hard to check it. Hundreds of my palms, among them an avenue of Royal Palms, huge and dense **Ficus** species, and magnificent clumps of **Pandanus**, were completely destroyed. The fire went over the entire front of the place and could

not be checked until it had made inroads of 300 feet. Then hundreds of buckets of water finally brought it under control. I rested this evening as I seemed entirely exhausted, but at ten a. m. the fire came directly from the West towards my little house. Two men and I had it finally under control but this afternoon it started in Mr. Haldeman's avocado grove directly northeast of my house. I had visitors at the time and all helped me to check it. I carried water and the boy and the guests used shovels and hoes and pine branches to extinguish it. I am perfectly tired out and last night I had no sleep at all. Whether or not most of my palm trees will survive I do not know. Tho' my losses are large, it might have been worse. Almost all the plants killed can be replaced from my reserve stock. Had the fire reached my slat houses the damage would have been enormous. I have not yet told my wife and children the whole story of the disaster."

In October, 1926, he writes,—“I had the finest and most interesting time of my life not only at Cornell, but also in Northern New York, the Adirondacks and even in that ant-hill of humanity, the City of New York—or rather “New Jerusalem”. In visiting the **International Plant Science Congress** at Ithaca, I met many great botanists personally, whose names I had known for many years. The University buildings are most wonderful and the campus extremely picturesque. Dr. Mez and I and others spoke about ideals of life. One, an American, made the remark that America could not be called a land of ideals as business alone was regarded as ‘worth while’. Dr. Mez said it was only necessary to look at those beautiful University buildings and their picturesque surroundings to be convinced that only a people of the highest and loftiest ideals could have created them. All of us applauded.

“Flower gardens in New York State disappointed me—mostly green lawns, very well kept could be seen. But when we went through the Shenandoah Valley and South and through South Carolina and Georgia, there were flower gardens galore.

“When returning to Gotha in October, I found the water of my lake far out of its former banks—at least 600 feet. All my fine **Camellias** stand 1 to 2 feet deep in water and where I used to grow my **Caladiums** the water is 3 to 4 feet deep. Here in Naples the fury of the hurricane is quite evident. All the red maples in the hammock swamp are torn to pieces, big pines up-rooted but there is no standing water and most of my plants have not been harmed. The roof of the house is gone and the house blown off its piers. My boy had had all my bedding and clothes dried in the sun and the books etc. aired. Many of the best books and photographs had suffered but little.”

A letter dated April 1927, states that this “was a double red letter day for me as Mr. and Mrs. Edison spent the entire day with me. We had great times and Edison is **really** a great man. I never knew that he was so much interested in plants. He took particular interest in my **Ficus** species about 100 different ones in number. Each was tested in regard to the quantity and quality of the rubber it contains and he went at it systematically and thoroughly. Both were enthusiastic about my plant articles in the **American Eagle** and spent several hours in my little shack, looking over my books and photographs, etc.”

Nehrling was a brave man, but great losses and disappointments in 1927 due to misplaced confidence in business associates whom he supposed to be his friends, really broke his heart and hope. When I last visited him in Naples in 1928 he was still carrying on with faith, hope and charity, trying amid innum-

erable hardships to help others to the best of his ability, and always generous to a fault, he added invaluable plants to my store of epiphytes from those that still remained in his possessions.

He was truly a man of whom the world was not worthy, and we shall not soon see his like again.

NEHRLINGIANA

THE PLANT WORLD IN FLORIDA. From the published manuscripts of Henry Nehrling. Collected and Edited by Alfred and Elizabeth Kay. Introduction by David Fairchild. Sponsored by the Garden Club of Palm Beach. New York, The MacMillan Company, 1933. 304 Pages. Price \$3.50

Here is one of those books, containing a quantity of immensely valuable material in its chosen field, but which nevertheless causes a feeling of regret in the reader because it might have been so much better and so much more complete.

The volume as it stands, it must be admitted, is a good introduction to sub-tropical and tropical ornamental horticulture, and for the material that is included in the pages by the editors, who undoubtedly toiled many a weary hour over pages without end, the book is highly recommended. But the fact remains, particularly clear to those who know the material available in Nehrling's works in print and in manuscript, that the result has been to deprive the book of much of human interest relating to the man, and place it in the category, more or less, of just another minor plant cyclopedia.

For instance, there are paragraphs and paragraphs about rare palms which are seldom seen in Florida, even in collections, while fancy leaved caladiums, on which the learned plantsman spent many years of study, and which have proven one of the most enduring monuments to his genius, are dismissed by the editors with two paragraphs on page 261. The "panama hat plants" get more than three pages.

The illustrations are no better than they should have been, considering the wealth of material of this kind available in the state.

Its shortcomings need not deter a student of the flora of the tropics and northern conservatories from purchasing the book and perusing it. It is worth the price, in spite of what it might have been.

There are good quotations from Nehrling's writings on Florida climate and soil; shade trees of Florida; palms; rubber or Ficus trees, orchids and other epiphytes, vines, bulbs, including *Hippeastrum* species and hybrids, on which Nehrling did much work, bamboos, cacti, and foliage plants. There is some account of *Crinums*, *Haemanthus*, *Hymenocallis*, *Amaryllis belladonna* and *Eucharis* among the Amaryllids treated.

The reader in northern climes will get the smell of humid tropical vegetation in his nose and visions of plants he can scarcely imagine in his mind. Graceful palms, airy *araucarias*, beautiful amaryllis, the distinctive *Gloriosa* or Climbing Lily, the prickly bromeliads, orchids, in other words, the aristocracy of the plant world, these were the broad fields in which Nehrling lived and performed his labors of love. Sketchy though it is, one can at least glimpse the full stature of the man in the writings here collected.

W. H.

SECRETARY'S MESSAGE

To the Officers and Members of the American Amaryllis Society—

The calendar year of 1933 witnessed the organization of the American Amaryllis Society (May 21), the enrollment of its charter members and the preparation of the first issue of the Society's Year Book, of which this item is a part. It was the formative period of the Society's growth.

In spite of the economic depression a group of Amaryllis enthusiasts had the faith in their favorite horticultural field to undertake the formation of a society, to be world-wide in its scope, devoted to the advancement of *Amarylleae* culture in all its branches. In a short time a membership that is really world-wide in its geography and international in its significance was attained. When this article was written, the Society had members in Great Britain, Holland, East Africa and Japan besides the various sections of the United States. The hearty response of *Amarylleae* enthusiasts was heartening and encouraging.

The major accomplishments of the Society in this early period of its existence are,—

The adoption of a Constitution and By-Laws; the adoption of the *Fischer Color Chart* as the official color chart of the Society; the preparation of a classification of flower types (*Hippeastrum*) for exhibition purposes; the adoption of a descriptive form for *Hippeastrum*; the adoption of a tentative prize schedule for *Amarylleae* and *Alstroemeriae*; and the preparation of a hybrid *Hippeastrum* check list.

The adoption of official popular names for various *Amarylleae*,—"Amaryllis" for *Hippeastrum*; "Belladonna Lily" for *Amaryllis belladonna*; "Crinum Lily" for *Crinum*; "Zephyr Lily" for *Zephyranthes*; "Amerindian Lily" for *Hymenocallis*; and "Aztec Lily" for *Sprekelia formosissima*.

Initial steps were taken for the importation of rare and interesting species of *Hippeastrum*, *Zephyranthes*, etc., through contact made with foreign botanical gardens, departments of agriculture, botanists, collectors and others. Arrangements were made and official permit obtained from the United States Department of Agriculture for the importation of bulbs of *Zephyranthes caerulea*, Bak., from Argentina. Steps were taken to locate a source of *Hippeastrum rutilum citrinum*, Bak., and *Hippeastrum procerum*, Lemaire, apparently not in the trade or in collections in Europe or the United States. The Society owes a debt of gratitude to the Bureau of Plant Quarantine of the United States Department of Agriculture for cooperation in these matters, and also to the Bureau of Plant Industry for valuable assistance rendered in difficult research problems.

The directors of the Society approved a tentative schedule of dedications for forthcoming issues of the Society's Year Book as follows: 1934, the late *Henry Nebrling*; 1935, *Mr. Theodore L. Mead*; 1936, *Mr. Alexander Worsley*; 1937, *Mr. E. H. Krelage*; 1938, the late *Rev. William Herbert*; 1939, *James Veitch & Sons*; and 1940, *Robert P. Ker and Sons*.

The Board of Directors decided to sponsor an annual *National Amaryllis Show* and voted to hold the 1934 exhibition at Orlando, Florida and the 1935 show in Southern California.

The progress of the American Amaryllis Society to date has been remarkable. The future development of this organization, as in the past, will require much real work. It has been the "golf", the principal recreation of its organizers up to the present time. All its labors have been labors of love and lightened on that account.

The present year of 1934, I am confident, will see an increasing interest displayed by flower growers in the *Amarylleae*. It is to be hoped that the members of the Society will do everything they can to help in this good work.

As to the Year Book, I can add nothing. It speaks for itself and for the unrelenting diligence and boundless care of the editor, *Dr. Hamilton P. Traub* of Orlando. Only he will ever know the hours and hours of enthusiastic application its production has cost.

Yours horticulturally,

WYNDHAM HAYWARD, *Secretary*.

Winter Park, Florida,
January 28, 1934.

REPORT OF EXHIBITIONS AND AWARDS COMMITTEE

The first National Amaryllis Show will be held in the main lobby of the Chamber of Commerce Building, Orlando, Florida, East Central Avenue, April 3—4, 1934. This lobby will accommodate 224 lineal feet of display benches carrying up to 900 six-inch pots without crowding. Although cut blooms are acceptable, it is suggested that all local exhibitors display their blooms with the bulb potted in six-inch pots if possible. Out of town growers may ship their blooms in bud to reach the Committee about two days before the Show in order to allow time for blooms to open for the show. The blooms should be cut just as the tip of the flower begins to bulge and packed in shagnum moss with waxed paper protecting the carton. Later cutting may cause the bloom to open in transit and earlier cutting may result in failure of flower to open. Be sure to ship in time to reach us about two days before the Show. A single scape of any variety, un-named or named, may be entered until 1937, after which date three scapes will be required.

The Committee wishes to thank Mr. Slaughter, Secretary of the Orlando Chamber of Commerce, for his kind co-operation in furnishing publicity and helping with the arrangements and also Radio Stations WDBO, Orlando, and WRUF, Gainesville, Fla. for the time given the Society on the Air.

The 1935 National Amaryllis Show will be held in Southern California. The place, dates and details will be arranged by a local committee, and final announcements will be made through the press.

I. W. HEATON, *Chairman.*

January 1934,
Orlando, Florida.

CRINUMS AND HIPPEASTRUMS IN THE ROYAL BOTANIC GARDENS, KEW, ENGLAND

The following list of *Crinums* and *Hippeastrums* cultivated at the Royal Botanic Gardens, Kew, England, was kindly furnished by the Curator.

Crinum abyssinicum
Crinum asiaticum
Crinum augustum
Crinum campanulatum
Crinum giganteum
Crinum kirkii
Crinum moorei
Crinum pendunculatum
Crinum ratrayii
Crinum sanderianum

Crinum heterostyle
Crinum schimperi
Hippeastrum aulicum
Hippeastrum bifidum
Hippeastrum equestre
Hippeastrum reginae
Hippeastrum pratense
Hippeastrum rutilum
Hippeastrum vittatum

REPORT OF TRIAL COLLECTIONS COMMITTEE

The committee has been fortunate in obtaining the free grant of lath house space and care for the trial collection of the Society in Florida, through the kindness of Mr. I. W. Heaton of Orlando, Florida, a member of the Society and the representative of the Southeast on this committee. It is located on Mr. Heaton's bulb farm near Orlando, Florida.

It will be the purpose of the committee to gather together specimens of all available species of the Amaryllis family in the special field of the Society for the purpose of making them available for study and examination by members and others interested. The committee will welcome donations of bulbs for the collection, and in time hopes to accumulate as complete a group of Amaryllids as possible by gifts, exchanges with botanic gardens, collectors, etc., and by importation of bulbs or seed of rare species and varieties.

The collection includes, at present, *Hippeastrum solandriflorum*, the gift of Mr. Robert D. Mitchell of Orlando; *Zephyranthes Ajax*, the gift of Mr. James L. Gebert, New Iberia, La., and also *Hippeastrum equestre*, *Crinum americanum*, and unidentified *Crinums* and *Hymenocallis*. The species in the collection will be checked with herbarium specimens on blooming and every effort will be made to have the collection botanically accurate.

After a few years, if natural propagation gives sufficient increase of the bulbs to numbers more than the collection needs, extra bulbs will be distributed on application to members of the Society particularly interested in the various kinds. It is the hope of the committee that by the end of 1934, donations will have made the collection one of the most representative of its kind. As soon as practicable other trial gardens in other parts of the country will be established. Every precaution for the proper cultivation and preservation of the bulbs donated to the collection will be taken.

W. HAYWARD, Chairman.

December 1933.
Orlando, Florida.

THE SOCIETY'S FISCAL YEAR

The fiscal year of the Society begins on January first, and the first fiscal year began on January 1, 1934. The Society was organized in 1933, and all who have paid dues in 1933 or 1934 have paid up their membership until January 1, 1935. They will receive one copy of the 1934 Year Book. The 1935 Year Book will be sent to all who pay dues during that year.

The first Year Book was published in February 1934 in order to make available preliminary information to the members. In the future the Year Book will be issued in September or October of each year, beginning in 1935.

Constitution and By-Laws of the American Amaryllis Society

CONSTITUTION

ARTICLE I.

NAME.

SECTION 1. This organization shall be known as the American Amaryllis Society.

ARTICLE II.

OBJECT OF THE SOCIETY.

SECTION 1. The object of the American Amaryllis Society shall be the promotion of *Sub-order I Amaryllaceae*, and *Sub-order II, Alstroemerieae Order Amaryllideae*. (Baker, J. G. Handbook of the Amaryllideae. George Bell & Sons. London. 1888).

ARTICLE III.

HEADQUARTERS.

SECTION 1. The headquarters of the American Amaryllis Society shall be maintained in Orlando, Florida.

ARTICLE IV.

MEMBERS.

SECTION 1. This Society shall consist of the following classes of members:

Annual Members
Life Members
Patrons
Corresponding Members
Fellows

ARTICLE V.

OFFICERS AND DIRECTORS.

SECTION 1. The officers of the Society shall consist of a President, three Vice Presidents, Secretary and Treasurer, who shall be elected annually. Provided, however, that one Vice-President shall be chosen from the Standard Time Zones according to the following grouping: (a) Eastern, (b) Central, and (c) Mountain and Pacific.

SECTION. 2. There shall be three Directors at large, elected from the membership of the Society, to serve terms of three years, one of whom shall be elected each year.

SECTION 3. The election of one director from each branch society may be established by By-law or action of the Board of Directors.

SECTION 4. Officers and Directors shall hold office until their successors are elected and assume their duties.

ARTICLE VI.

BOARD OF DIRECTORS.

SECTION 1. The Board of Directors shall consist of the Officers and Directors of the Society, as provided in Article V, Sec. 1 and 2.

SECTION 2. The Board of Directors shall be the governing body of the Society, and shall have power to act on all matters pertaining to the Society.

SECTION 3. The Board of Directors shall meet at stated intervals and at the call of the president.

SECTION 4. One-third of the members of the Board of Directors or their proxies, shall constitute a quorum for the transaction of business.

SECTION 5. Members of the Board of Directors who are unable to be present at meetings of the Board may designate proxies, said proxies to be other than regular members of the Board. No person shall hold more than one proxy.

ARTICLE VII.

ELECTION OF OFFICERS AND DIRECTORS

SECTION 1. Any voting member may submit to the Secretary, not less than sixty days before the annual meeting, nominations for Officers and Directors. These shall be submitted to a nominating committee, who shall select the candidates for any office.

SECTION 2. The names of the two persons receiving the highest number of nominating votes for each office shall be included in the final ballot, together with such additional names as the nominating committee shall select; provided that in case any person is nominated by the nominating ballot for more than one office, as provided above, the nominating committee shall determine the office for which the nomination shall stand.

SECTION 3. Officers and Directors shall be elected by mail ballot. The votes shall be canvassed as provided for in the By-Laws. A plurality vote shall elect.

ARTICLE VIII.

BRANCH SOCIETIES.

SECTION 1. For the purpose of developing regional interest in the objects of the Society, the Board of Directors may authorize regional, state or local branches.

SECTION 2. All members of Branch societies shall be fully paid members of the American Amaryllis Society.

SECTION 3. Branch Societies shall form and conduct their own organizations, subject to this Constitution and By-Laws.

SECTION 4. Activities of Branch Societies which might interfere with the interests and policies of other branches or of the Society at large, shall be subject to the action of the Board of Directors.

ARTICLE IX.

COMMITTEES AND SECONDARY OFFICERS.

SECTION 1. Standing committees may be established by By-Law or action of the Board of Directors.

SECTION 2. The position of editor, librarian, and other secondary officers may be established by By-Law or action of the Board of Directors.

SECTION 3. Special committees may be authorized by action of the Board of Directors or by plurality vote of the members present at any regular meeting of the Society.

ARTICLE X.

MEETINGS OF THE SOCIETY.

SECTION 1. The Annual meeting of the Society shall be held on the second Wednesday in April. Other meetings shall be held at the call of the Board of Directors.

ARTICLE XI.

PUBLICATIONS.

SECTION 1. The Society shall sponsor a year book and such other publications as may be authorized by the Board of Directors.

ARTICLE XII.

AMENDMENTS.

SECTION 1. This Constitution may be amended by the following procedure: The proposed change shall be submitted in writing to the Secretary, supported by the signature of not less than ten members in good standing, at least fifteen days prior to an annual meeting. A copy of the proposed amendment shall be supplied to each member with the report of the annual meeting. At the time of the next annual election a copy of the proposed amendment shall be mailed to each member with the ballots. Votes on the amendment shall be returned with the election ballots and be canvassed by the Board of Directors. Two-thirds of the ballots cast must be in the affirmative for the amendment to be adopted.

BY-LAWS

ARTICLE 1.

ORDER OF BUSINESS.

The following order of business shall be observed at all meetings unless set aside by vote:

1. Call to order.
2. Reading of minutes of previous meeting.
3. Reports of officers and committees.
4. Communications and resolutions.
5. Unfinished business.
6. New business.
7. Adjournment.

ARTICLE 2.

CLASSES OF MEMBERSHIP.

SECTION 1. Annual Members,—Persons who are interested in the purposes of the Society who shall pay annual dues of two dollars.

SECTION 2. Life Members,—Persons interested in the purposes of the Society who shall pay one hundred dollars, or who secure fifty or more new members in any 12 months period.

SECTION 3. Patrons,—Persons interested in the objects and aims of the Society who contribute two hundred dollars or more to its support, and who shall pay no dues.

SECTION 4. Corresponding Members,—Those whom the Society has elected in foreign countries to report on subjects of interest to the membership and who shall pay no dues.

SECTION 5. Fellows,—Those whom the Society has elected as Fellows in recognition of their achievements in the special field of the Society and who shall pay no dues.

ARTICLE 3.

VOTING PRIVILEGES.

SECTION 1. Only annual members, life members, patrons and Fellows shall be entitled to vote.

SECTION 2. Only annual members in good standing, life members, patrons and Fellows shall be eligible to hold office.

ARTICLE 4.

ELECTION OF MEMBERS.

SECTION 1. Nominations for membership in the Society shall be presented to the Secretary in writing, accompanied by the required dues. All applicants for membership shall be approved by the membership committee, subject to review and action by the Board of Directors.

ARTICLE 5.

ELECTION OF OFFICERS AND DIRECTORS.

SECTION 1. The Secretary shall send to all voting members, not less than 90 days before the date of the election, a list of the offices to be filled, together with the names of those whose terms expire.

SECTION 2. The Board of Directors shall select a nominating committee of three members at least two months before the annual meeting.

SECTION 3. The nominating committee shall obtain the written consent to serve from all nominees before the names are placed on the final ballot.

SECTION 4. Ballots shall be sent to each member one month before the annual meeting. Ballots shall be returned to the Secretary and must reach him not less than five days before the annual meeting.

SECTION 5. The President shall appoint at least three tellers to canvass the final vote for each office.

ARTICLE 6.

DUTIES OF OFFICERS.

SECTION 1. The President shall perform the usual duties of such office, be the directing head of the Society, and chairman of the Board of Directors.

SECTION 2. The Vice-Presidents in order of seniority in years shall act in the absence or incapacitation of the President.

SECTION 3. The Secretary shall keep a record of the proceedings of the Society and of the Board of Directors, and conduct their correspondence. He shall collect and pay to the Treasurer all moneys due the Society, getting his receipt therefor. He shall also keep a record of all receipts and expenditures of the Society as authorized by the Board of Directors.

SECTION 4. The Treasurer shall receive from the Secretary all moneys belonging to the Society and shall deposit the same, as directed by the Board of Directors. He shall pay out all moneys only on written notice from the Board of Directors. All payments shall be made by check, signed by the Treasurer, on accounts approved by the Board of Directors.

SECTION 5. The Board of Directors shall arrange for meetings of the Society and for exhibitions and tours. It may appoint sub-committees from its members or committees from the Society at large for specific purposes. It shall consider the formation of branch societies. If a vacancy occurs in any office of the Society, the Board of Directors shall fill the vacancy by appointment for the unexpired term.

ARTICLE 7.

PAYMENT OF DUES.

SECTION 1. The fiscal year of the Society shall begin on the first day of January.

SECTION 2. The year book shall be sent only to those members who have paid their dues for the current year. Members whose dues have not been paid by March 1st shall be considered delinquent. They will not be entitled to receive the publications or other benefits of the Society until arrears are paid.

SECTION 3. The names of all members whose dues have not been paid by July 1st shall be dropped from the rolls of the Society. Due notice of non-payment of dues will be mailed to delinquent members on or after March 1st, but nothing in this Article shall be construed as making such notice obligatory on the part of the officers of the Society, or the non-receipt of such notice the cause for any action against the Society or its officers on account of removal from membership, or non-receipt of any of the Society's publications or other benefits.

ARTICLE 8.

MEETINGS OF THE BOARD OF DIRECTORS.

SECTION 1. A meeting of the Board of Directors shall be held on or before the first Wednesday in April of each year, for outlining the work and activities of the year.

SECTION 2. Other meetings will be held by direction of the Board.

SECTION 3. Special meetings may be held on two weeks' notice at the call of the President, or on request of three members of the Board.

ARTICLE 9.

BRANCHES.

SECTION 1. Each state and regional branch society shall elect a member to represent it on the Board of Directors.

SECTION 2. Regional or state branch societies having representation on the Board of Directors shall consist of not less than fifty members residing in such region or state.

SECTION 3. Fifty cents of the membership dues of each branch member shall be made available for the use of the regional, state, or local branch to which the member belongs.

ARTICLE 10.

STANDING COMMITTEES.

SECTION 1. As soon as practicable after the annual meeting, the President shall appoint the following standing committees:

- | | |
|-----------------|---------------------------|
| 1. Membership | 5. Exhibitions and Awards |
| 2. Finance | 6. Trial Collections |
| 3. Auditing | 7. Research |
| 4. Publications | |

ARTICLE 11.

SECONDARY OFFICERS.

SECTION 1. As the need shall arise the Board of Directors shall appoint an editor, a librarian, or such other secondary officers as may be needed.

ARTICLE 12.

AWARDS.

SECTION 1. The Society may award, in accordance with the importance and value of the exhibit or contribution to the culture of the AMARYLLEAE and ALSTROEMERIEAE, Gold Medals, Silver medals, Bronze medals, First Class Certificates, Awards of Merit, Cultural Certificates and other awards.

SECTION 2. The Society may recognize by suitable award persons, corporations, or other institutions who or which have made great contributions to the culture of the AMARYLLEAE and ALSTROEMERIEAE.

ARTICLE 13.

PUBLICATIONS.

SECTION 1. The Board of Directors shall supervise the issuing of the publications of the Society.

SECTION 2. The publications of the American Amaryllis Society shall not be sold or otherwise furnished to other than members of the Society except as approved by the Board of Directors.

SECTION 3. Back numbers of publications may be sold to new members desiring copies of the same at prices as determined by the Board of Directors.

ARTICLE 14.

AMENDMENTS.

SECTION 1. An amendment to the By-Laws may be adopted by a majority vote at any meeting of the Board of Directors, providing a notice in writing has been mailed to all members of the Board one month in advance of the meeting.

SECTION 2. A proposal to amend the By-Laws may be submitted in writing to the Board of Directors by any branch society or by any five members.

1. Amarylleae Exhibitions and Regional Activities

THE AMARYLLIS IN ENGLAND

THE HON. HENRY D. McLAREN, *North Wales, Great Britain*

The Amaryllis Family, *Amaryllidaceae*, is a very large one, and botanically the name *Amaryllis* applies only to *Amaryllis belladonna*, although horticulturally the name ranges over a wide range of genera. But when one speaks colloquially of amaryllis—at any rate in England—one means the hybrid *Hippeastrum*—in its best forms one of the world's most noble flowers.

It is of course a greenhouse plant in England requiring stove temperature during its growing season if it is to show its best; but in the winter when it is dried off it needs no more heat than will safeguard the bulb from frost.

Various *Hippeastrum* species are grown by those botanically inclined, such as *H. aulicum*, *H. reticulatum*, and *H. vittatum*, all for the greenhouse, *Acramannii* (Garaway, 1835), a scarce and just hardy plant and *H. pratense* (*Haebranthus pratensis*) thrive in warm places outdoors. The latter species is a wonderful sight when it produces freely its flaming orange scarlet flowers. But for one plant of any of the species a hundred plants of the hybrids are grown in England. Their cultivation is easy, their flowering is regular, and by starting them early or late, as the case may be, they can be brought into bloom at such a date, from January to May, as may be desired by the grower. By constant hybridization and selection since the year 1799, the modern hybrid amaryllis has got far ahead of its original progenitors. An exceptionally good bulb may have two spikes of flower with four blooms on each. I happened to measure a large flower once, and it was 10 inches by 8 inches in size. The flowers range from dark scarlet with maroon centre to the purest unspotted white—and indeed a good batch of the pure white form is one of the loveliest plant groups that can be grown.

It is told that the first pure white amaryllis that appeared was a jealously guarded treasure, and it was exhibited at a show by its owner with the greatest pride. But a sharp and sharp nosed individual smelt at its perfume long and closely and then hurriedly left the show. At the door he got out his knife, scraped some adhering pollen from his nose, and hastened to put it on the stigma of a plant in his own greenhouse. The progeny of this ingeniously contrived cross included some white flowered plants, which were thus brought into more general cultivation.

In this country Messrs. James Veitch & Sons of Chelsea and Messrs. Robert Ker & Sons of Liverpool did much to improve the breed of amaryllis. Both these firms have however now ceased to exist and the best strains are carried on by amateurs. The late Sir George Holford of Westonbirt devoted much time and skill to raising improved forms, and when his collection was dispersed, a large portion of it went to Mr. Clive Cookson of Hexham. Sir George paid much attention to getting a flower of good substance and of self colour. The Rothschild family have always been interested in this plant, and the collections formed by more than one member of the family have descended to Mr. Lionel

de Rothschild at Exbury—where hybridization is carried on energetically, and where scarlet forms are made a feature.

Baron Schroeder has also a fine collection at The Dell. The collection at Bodnant is founded on the Ker strain, but, as in other collections, home raised plants have gradually ousted the older ones. Among the plants grown here are white forms and a fine form with a white ground suffused with rose pink originated by Ker and called by him "Nestor."

Unfortunately, greenhouses are somewhat out of favour these days and amaryllis are not so widely grown in England as they were; but every year the hybridists improve them, and what we have lost in quantity we have, I believe, gained in quality.

DESCRIPTIVE REVIEW OF THE 1933 U. S. DEPARTMENT OF AGRICULTURE AMARYLLIS SHOW

AND NOTES ON 1934 EXHIBITION

Bureau of Plant Industry, *United States Department of Agriculture*,
Washington, D. C.

The twentieth annual Amaryllis Show of the U. S. Department of Agriculture was held from 9:00 a. m. to 9:00 p. m. daily, March 20 to March 27, 1933, both dates inclusive, at the Greenhouses of the U. S. Department of Agriculture, Constitution Avenue at Fourteenth Street, N.W., Washington, D. C.

On display in the exhibition were 1,200 amaryllis plants which ranged in color from dark red through various shades of red, orange-red, pink and striped types to pure white. Each plant bore two flower stems with from two to seven flowers on each stem. Some of the flowers measured as much as ten inches from tip to tip. The bulbs in flower were all hybrids originated by the Department. A number of seedlings which were flowering for the first time were included in the show.

The exhibition was attended by 23,820 people. This number was lower than the attendance for previous years due to the fact that for at least half the period of the show the weather was inclement. The visitors to the exhibition included Mrs. Franklin D. Roosevelt, Mrs. Henry A. Wallace, other cabinet ladies and groups from public and private schools and garden clubs. Many of the visitors were from near-by states and, in some instances, from points as distant as New York City.

The twenty-first annual Amaryllis Show which will be held sometime in March of 1934 will include new seedling plants flowering for the first time. It is expected that the custom of the wife of the Secretary of Agriculture holding a preliminary showing will be revived for that exhibition. Such a preliminary showing was not held last year as the display was opened too soon after the inauguration of the new administration. The guests at the preliminary showings are the wife of the President of the United States, and the wives of cabinet officers, of the diplomatic corps, of Justices of the Supreme Court, of members of both houses of Congress, of ranking officers of the Army and Navy, of officials of the Department of Agriculture and members of residential society.

TENTATIVE CLASSIFICATION OF AMARYLLIS FLOWER TYPES FOR EXHIBITION PURPOSES*

At this time it is an open question as to the types of flowers which should be standardized in hybrid Amaryllis. Only time will tell what the preference of the membership will be in this matter. For exhibition purposes, therefore, Amaryllis shall be placed tentatively into the (I) Grandiflora, and (II) Miniature groups on the basis of flower types found in the 38 species,—

Grandiflora Group

The Grandiflora group is tentatively divided into the following subgroups,—

- (a) Tube long SOLANDIFLORUM TYPE
(*Hippeastrum solandriflorum* and hybrids of this flower type)
- (b) Tube short closed in with distinct neck at throat PSITTACINUM TYPE
(*H.aulicum*; *H.organense*; *H.psittacinum*; *H.cybister*; *H.calyptratum*; *H.pardinum*; and hybrids of this flower type)
- (c) Tube short; not closed at throatEQUESTRE TYPE
(*H.equestre*; *H.reticulatum*; *H.stylosum*; *H.rutilum*; *H.vittatum*; *H. breviflorum*; and hybrids of this flower type..
- (d) Tube very short; not closed at throat LEOPOLDI TYPE†
(*H.andreanum*; *H.reginae*; *H.miniatum*; *H.scopulorum*; *H.mandoni*; *H. leopoldi*; *H. procerum*; and hybrids of this flower type.)

Miniature Group

The Miniature group is tentatively divided into the following subgroups,—

- (a) Tube narrowly funnel shaped PHYCHELLA TYPE
(*H.phycelloides*; *H.bicolor*; *H.herbertianum*; and hybrids of this flower type.)
- (b) Tube openly funnel-shapedHABRANTHUS TYPE
(*H.soratense*; *H.chilense*; *H.roseum*; *H.lineatum*; *H.brachyandrum*; *H.advenum*; *H.bifidum*; *H.bagnoldi*; *H.berteroanum*; *H.jamesoni*; *H.modestum*; *H.rhodolirion*; *H.uniflorum*; *H.montanum*; *H.pratense*; and hybrids of this flower type.)

TENTATIVE PRIZE SCHEDULE *

SYNOPSIS OF SECTIONS AND CLASSES

Section A. Amaryllis (<i>Hippeastrum</i>);	Classes	1- 499
Section B. Crinum Lily (<i>Crinum</i>);	Classes	500- 599
Section C. Zephyr Lily (<i>Zephyranthes</i>);	Classes	600- 699
Section D. Amarylleae Genuinae, except Sections A, B and C Above	Classes	700- 799
Section E. Amerindian Lily (<i>Pancratiae</i>);	Classes	800- 899
Section F. Alstroemerieae;	Classes	900- 999
Section G. Narcissi and Relatives; (<i>Coronate</i>);	Classes	1000-1099

* Report of the Special Committee on Description, Nomenclature and Check List approved by the Board of Directors.
 † Possible subdivisions,—“Reginae Type,” petals irregular; “Leopoldi Type,” petals regular.

Professional Classes And Awards

At the annual *National Amaryllis Show*, and at other exhibitions, as voted by the Board of Directors, the Society will award its *First Class Certificate* for meritorious new varieties; its *Award of Merit*; and its first, second, third and fourth prize ribbons, in the classes indicated below. Any money-prizes offered shall be authorized by action of the Board of Directors.

Each species or varietal exhibit shall consist of one or more potted flowering plants, or one or more flower scapes up to and including 1937; after which date three potted flowering plants or three flower scapes shall be required in each case. For the present, in the color classes, varieties with flowers minutely dotted, keeled, striped, cross-barred, etc. shall be grouped according to the predominating color.

Section A. Amaryllis (Hippeastrum)

- Class 1. Best collection of botanical species and varieties.
- Class 2. Best collection of 10 or more named Grandiflora varieties.
- Class 3. Best collection of 5 to 10 named Grandiflora varieties.
- Class 4. Best collection of 5 or more Miniature varieties.
- Class 5. Best Display.
- Class 6. Best Bloom in Show.

Standard Grandiflora Varieties

SOLANDRIFLORUM TYPE Classes 100-129

- | | |
|--------------------------------------|----------------------------|
| Class 101. White without markings | Class 107. Light red |
| Class 102. White with light markings | Class 108. Red |
| Class 103. Yellow | Class 109. Dark red |
| Class 104. Orange | Class 110. Darker red |
| Class 105. Pale red | Class 111. Any other color |
| Class 106. Lighter red | Class 112. Best bloom |

PSITTACINUM TYPE Classes 130-159

- | | |
|--------------------------------------|----------------------------|
| Class 131. White without markings | Class 137. Light red |
| Class 132. White with light markings | Class 138. Red |
| Class 133. Yellow | Class 139. Dark red |
| Class 134. Orange | Class 140. Darker red. |
| Class 135. Pale red | Class 141. Any other color |
| Class 136. Lighter red | Class 142. Best bloom |

EQUESTRE TYPE Classes 160-189

- | | |
|--------------------------------------|----------------------------|
| Class 161. White without markings | Class 167. Light red |
| Class 162. White with light markings | Class 168. Red |
| Class 163. Yellow | Class 169. Dark red |
| Class 164. Orange | Class 170. Darker red |
| Class 165. Pale red | Class 171. Any other color |
| Class 166. Lighter red | Class 172. Best bloom |

LEOPOLDI TYPE Classes 190-219

- | | |
|--------------------------------------|----------------------------|
| Class 191. White without markings | Class 197. Light red |
| Class 192. White with light markings | Class 198. Red |
| Class 193. Yellow | Class 199. Dark red |
| Class 194. Orange | Class 200. Darker red |
| Class 195. Pale red | Class 201. Any other color |
| Class 196. Lighter red | Class 202. Best bloom |

Standard Miniature Varieties

PHYCHELLA TYPE Classes 220-249

- | | |
|--------------------------------------|----------------------------|
| Class 221. White without markings | Class 227. Light red |
| Class 222. White with light markings | Class 228. Red |
| Class 223. Yellow | Class 229. Dark red |
| Class 224. Orange | Class 230. Darker red |
| Class 225. Pale red | Class 231. Any other color |
| Class 226. Lighter red | Class 232. Best bloom |

HABRANTHUS TYPE Classes 250-279

- | | |
|--------------------------------------|----------------------------|
| Class 251. White without markings | Class 257. Light red |
| Class 252. White with light markings | Class 258. Red |
| Class 253. Yellow | Class 259. Dark red |
| Class 254. Orange | Class 260. Darker red |
| Class 255. Pale red | Class 261. Any other color |
| Class 256. Lighter red | Class 262. Best bloom. |

Section B. Crinum Lily (Crinum)

- Class 501. Best collection of botanical species and varieties
 Class 502. Best collection of hybrid varieties
 Class 503. Best Bloom.

Section C. Zephyr Lily (Zephyranthes)

- Class 601. Best collection of botanical species and varieties
 Class 602. Best collection of hybrid varieties
 Class 603. Best Bloom.

- | | |
|------------------------|-----------------------------|
| Class 651. White | Class 657. Red |
| Class 652. Yellow | Class 658. Dark red |
| Class 653. Orange | Class 659. Darker red |
| Class 654. Pale red | Class 660. Blue |
| Class 655. Lighter red | Class 661. Any other color. |
| Class 656. Light red | |

Section D. Amarylleae Genuinae, Except Sections A, B and C, Above

- Class 701. Best collection of botanical species and varieties, in any Genus.
 Class 702. Best collection of hybrid varieties in any Genus.
 Class 703. Best Bloom in any Genus.

Section E. Amerindian Lily (Pancratiaeae)

- Class 801. Best collection of botanical species and varieties in any Genus.
 Class 802. Best collection of hybrid varieties in any Genus.
 Class 803. Best Bloom in any Genus.

Section F. Alstroemeriae

- Class 901. Best collection of botanical species and varieties in any Genus.
 Class 902. Best collection of hybrid varieties in any Genus.
 Class 903. Best Bloom in any Genus.

Section G. Narcissi and Relatives (Coronate)

- Class 1001. Best collection of botanical species and varieties in any Genus.
 Class 1002. Best collection of hybrid varieties in any Genus.
 Class 1003. Best Bloom in any Genus.
- Class 1075. Best collection of *N. tazetta* subspecies
 Class 1076. Paperwhite Grandiflorus.
 Class 1077. Grand Soleil d'Or.
 Class 1078. Chinese Sacred Lily.
 Class 1079. Best collection of *N. tazetta* hybrids.

Amateur, Novice and Boys' and Girls' Classes and Awards

In all the classes indicated above, separate awards will also be made for *Amateur*, *Novice* and *Boys'* and *Girls'* exhibits.

2. Standardization of Color Descriptions

FISHER COLOR CHART OFFICIALLY ADOPTED

Part of the work assigned to the Special Committee on Description, Nomenclature, and Check List was to find a practical means of standardizing *Amarylleae* color descriptions. After considering other possibilities such as Maerz and Paul, *Dictionary of Color* (1930), and Ridgeway, *Color Standards and Nomenclature* (1912), the committee reported that the *Fischer Color Chart* (1932), published by the New England Gladiolus Society, appeared to be the most practical device now available for the purpose. It is adequate for most purposes, easy to use and inexpensive. With the kind permission of the Publishers, the *Fischer Color Chart* was officially adopted by action of the Board of Directors.

It is recommended that the *Fischer Color Chart* be used whenever possible in reporting *Amarylleae* color descriptions in the Year Book and elsewhere. *The users of this Chart should bear in mind that the Colored printing inks, especially the red, employed in the process for reproducing the chart, do not hold their color permanently if exposed to strong light.* The chart should not be hung exposed on a wall but kept carefully away from light when not actually in use.

The Publishers of the *Chart* have generously agreed to furnish the same to members of the American Amaryllis Society at \$1.00 unmounted, and \$1.50 mounted on heavy cardboard, and folding like a checker board to protect the colors from light. Enquiries should be addressed to your Secretary, Mr. Wyndham Hayard, 2240 Fairbanks Ave., Winter Park, Fla.

—HAMILTON P. TRAUB, and I. W. HEATON,
Special Committee on Description, Nomenclature and Check List.

ORIGIN OF THE FISHER COLOR CHART

EUGENE N. FISCHER, *Massachusetts*

In serving at gladiolus exhibitions in the capacity of a judge it was surprising to me to see that quite a number of the exhibitors had their entries wrongly placed in the color sections. It appeared that the fault lay more in confusing the names of the colors than in not knowing color, or seeing color wrongly. So one could conclude that the exhibitor did not know just what color the names meant that were used to designate some of the color classes.

The thought came to me that the exhibitor would be better guided in the placing of his exhibits properly if just the six simple color names of the spectrum, modified with adjectives denoting the degree of light or darkness, should be used. To suggest this form of simple color nomenclature I wrote an article entitled, "*Helpful Hints as to Colors*" for the 1930 Year Book of the New England Gladiolus Society.

In this article was described how all the colors, with their tints and shades, are variations derived from the three primary colors—Red, Yellow, and Blue. The main object was to point out that by using only six spectrum color names the relation of the colors to each other could be shown, and a better idea of the color conveyed than by using many names that are unfamiliar to most of us.

For instance, if the description of the color of a flower was blue-violet, we would know by the color name that it is predominately violet—nearer to violet than blue. Or, if described as violet-blue it would be nearer to blue. A name unfamiliar to the majority of persons would not denote the exact placement of the color in the spectrum, except to a very limited few.

The following year, being put on the Color Classification and Schedule Committee of the New England Gladiolus Society, I made a diagram sketch of the six

important spectrum colors with their intermediates and variations in a circle, to show the idea of this simple color nomenclature to the committee. The other members of the committee were much impressed with its clarity, and suggested that I make a color chart based on the idea of the sketch. The chart was worked out in oil colors and was completed in time to be used at our annual exhibition in 1931, where it was tried out successfully.

The Executive Committee of the Society then decided to make the chart available for the use of all members. The difficult problem came up as to how it should be reproduced by a printing process to approach as nearly as possible the color values of the original.

After much consideration the Four-Color Halftone Process was chosen, employing red, yellow, and two distinct blues. The result of the final printing was very close to the original chart and amply serves the practical purposes and underlying idea behind it, which are so well explained by Mr. Frank O. Shepardson in another article.

THE FISHER COLOR CHART

F. O. SHEPARDSON, *Massachusetts*

One of the hardest problems confronting introducers and lovers of beautiful flowers is a method of adequately describing the colors of their favorites so that others may get a fair idea of the exact hue intended. In order to do this it is obvious that there must be some common standard of color names so that a descriptive term must mean the same thing to all concerned.

How far removed from this so desirable condition we have strayed is most distressingly evident when we try to decipher some of the color descriptions in current catalogs. For instance when we find the terms *Begonia Rose*, *Hermosa Pink*, *Eosine Pink*, *Vinaceous Lavender*, *Jasper Pink*, *Pinard Yellow*, etc., how nearly definite an idea do they convey to most of us? Even the older and more common names such as *Lavender*, *Salmon*, *Purple*, *Mauve*, *Buff*, etc., convey such widely varying impressions to different people as to be incredible.

What appears to be our greatest need therefore is an entirely simplified, accurate, comprehensive system of descriptive color terminology, suitably illustrated for comparative purposes. This is exactly what is offered in the *Fischer Color Chart*.

The Fisher Color Chart consists of an accurately produced spectrum wheel divided into 6 sections, one for each spectrum color, and each section divided into 3 segments, the center group being the pure spectrum color with the addition of black and white, while on either side is shown the same color combined with a smaller amount of the neighboring color. Thus between Orange and Red are 2 groups, the one called Red-Orange, being composed of approximately $\frac{2}{3}$ Orange modified by $\frac{1}{3}$ Red, while the other named Orange-Red consists of $\frac{2}{3}$ Red and $\frac{1}{3}$ Orange. (See Fig. 1.)

Again, each of the 18 color groups is graded into 6 tones or values from dark to light, the 2 inner bands showing the addition of black and the outer 3 bands the addition of white. While these varying tones are described on the chart as Dark, Darker, Light, Lighter, and Pale, many of those most familiar with the chart have numbered the bands from 1 to 6 beginning with the darker center band as No. 1, and refer to the bands by number rather than by name.

Now as to the actual workability of the chart, take any ordinary flower, determine a section of the petal that fairly represents the average color of the flower, and place on the chart. A few seconds will suffice to determine which plate most nearly matches. Designate it with the group letters plus the number of the band, (thus—O R 5) and any one of the thousands of *Fischer Color Chart* owners can tell instantly almost exactly the hue intended. Even where a perfect match is not found it is easy to qualify thus—Between O R 4 and R O 4. At the Boston Show in 1931 when the original *Fischer Color Chart* was first shown a group of *Gladiolus* fans compared and placed every variety entered in the open classes, well over 100 kinds, and in no cases were we unable to agree as to which plate was nearest, in almost every case within a few seconds.

Even to the person who has never seen the *Fischer Color Chart*, the descriptive terminology conveys a pretty definite impression. For instance—Light-Red-Violet: $\frac{2}{3}$ Violet and $\frac{1}{3}$ Red with approximately 25% of white added—surely not so hard to get some idea of the hue intended.

The basic idea is simply this, that in the 6 spectrum colors with the addition of black or white lies the entire range of color. Every hue in existence is made up of some one or more of these, and it should not be difficult to describe any hue, using only these definite spectrum names, leaving no question of opinion as to the exact meaning of some indefinite descriptive term.

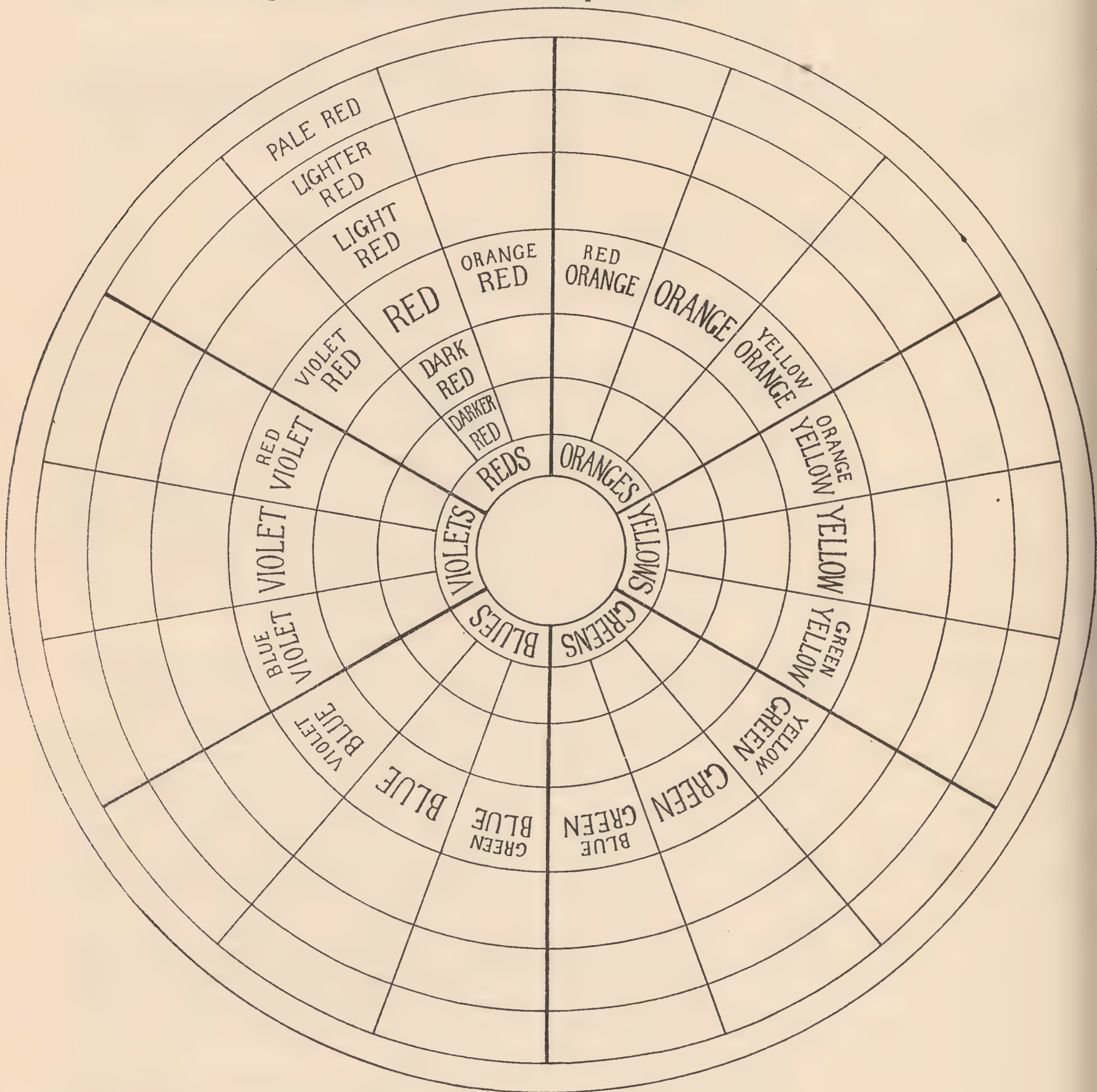


FIG. 1. FISCHER COLOR CHART

A further outstanding service to *Fischer Color Chart* owners will soon be available. Mr. Francis Bibby of Medfield, Mass., has compiled a correlation of several hundred of Ridgway's most commonly used terms, giving the color analysis of each and designating which plate on *Fischer's Chart* most nearly illustrates it. Thus the *Fischer Color Chart* becomes a key to *Ridgway* terminology, and this should prove of inestimable value to all interested in color description. This correlation will be published in the 1934 issue of the New England Gladiolus Society Year Book.

3. Description of the Amaryllideae

BOTANICAL DESCRIPTION

This section will serve as an inventory of the plant material in which the Amaryllideae enthusiast is interested. On account of space limitations, only three subjects are included under this head in this issue of the Year Book,—(a) Key to the Genera of the AMARYLLEAE and ALSTROEMERIEAE, (b) The Species of the GENUS HIPPEASTRUM, and (c) The GENUS AMARYLLIS. In future issues it may be practicable to include other important Genera,—CRINUM, ZEPHYRANTHES, HYMENOCALLIS, etc. The classical work on the Amaryllidaceae was published by William Herbert in 1837. This has served as a foundation of all later systematic work on this plant family. The latest revision of the Genera and Species of the Amaryllideae was published by Baker in 1888. As First-Assistant in the Herbarium at Kew Gardens, he had the opportunity of examining living specimens of most of the species included in his monograph. Both of these works are out of print and difficult to obtain. We are happy, therefore, to state that the Key to the Genera of Suborder I—AMARYLLEAE, Suborder II—ALSTROEMERIEAE and the species of the Genera HIPPEASTRUM and AMARYLLIS according to Baker are reprinted by kind permission of the publishers, Messrs. G. Bell & Sons, Ltd., York House, Portugal Street, London, W.C. 2.—Ed.

Key to The Genera of Suborder I.—Amarylleae and Suborder II— Alstroemerieae of The Order Amaryllideae, According to Baker 1888.

Suborder I. AMARYLLEÆ.—Rootstock a tunicated bulb. Leaves all radical. Peduncle a leafless scape.

Tribe 1. CORONATÆ.—Flower furnished with a corona between the perianth and stamens.

1. CRYPTOSTEPHANUS.—Perianth funnel-shaped; tube long. Corona of 12 minute linear scales.—Angola. [1]¹

2. NARCISSUS.—Perianth hypocrateriform; tube long. Corona a distinct petaloid cup.—Europe, West Asia, North Africa. [27]

3. TAPEINANTHUS.—Perianth-tube very short. Corona of 6 minute scales.—Spain, Morocco. [1]

4. PLACEA.—Perianth funnel-shaped; tube very short. Corona small, membranous, deeply 6-cleft.—Chili. [5]

Tribe 2. AMARYLLEÆ GENUINÆ.—Corona none; filaments free.

* *Anthers erect; filaments inserted at or near the base.*

† *Stamens epigynous; filaments short.*

5. GALANTHUS.—Inner segments different from the outer, permanently connivent.—South Europe, West Asia. [6]

6. LEUCOJUM.—Perianth-segments all alike. Filaments short.—South Europe, North Africa. [9]

7. LAPIEDRA.—Perianth-segments all alike. Filaments long.—Spain. [1]

†† *Stamens perigynous; anthers small, globose.*

8. HESSEA.—Perianth-tube none are very short.—Cape. [8]

9. CARPOLYZA.—Perianth-tube distinct.—Cape. [1]

¹ The numbers in brackets indicate the number of species admitted by Baker.—Ed.

††† *Stamens perigynous; anthers oblong or linear-oblong.*

Flowers solitary.

10. GETHYLLIS.—Peduncle short. Perianth hypocrateriform. Stamens uniseriate, often numerous.—*Cape*. [9]

11. APODOLIRION.—Peduncle short. Perianth funnel-shaped. Stamens biseriate.—*Cape*. [6]

12. COOPERIA.—Peduncle elongated.—*Texas & North Mexico*. [2]

Flowers umbellate.

13. ANOIGANTHUS.—Perianth-tube very short. Filaments long, filiform.—*Cape*. [11]

14. CHLIDANTHUS.—Perianth-tube long. Filaments short, dilated at the base.—*Andes*. [11]

** *Anthers dorsifixed, versatile.*

† *Ovules many, superposed; testa black.*

Flowers solitary; spathe tubular in the lower half.

15. STERNBERGIA.—Peduncle short or produced. Perianth regular, erect, bright yellow. Seeds globose.—*South Europe, West Asia*. [4]

16. HAYLOCKIA.—Peduncle short. Perianth regular, erect, whitish. Seeds flat.—*Monte Video, Buenos Ayres*. [11]

17. ZEPHYRANTHES.—Peduncle elongated. Perianth regular, erect or suberect. Seeds flat.—*America*. [34]

18. SPREKELIA.—Perianth ringent, horizontal, bright red; 3 lower segments convolute; stamens and style declinate.—*Mexico & Guatemala*. [11]

Flowers umbellate. Spathe 2—4-valved, and pedicels subtended by filiform bracteoles.

19. UNGERNIA.—Perianth-tube short. Seeds many in a cell, flat, winged. Peduncle solid.—*Asia*. [3]

20. LYCORIS.—Perianth-tube short. Seeds few in a cell, turgid. Peduncle solid.—*China & Japan*. [5]

21. HIPPEASTRUM.—Perianth-tube usually short, rarely long. Seeds many in a cell, usually flat. Peduncle hollow.—*America*. [38]

22. VALLOTA.—Flowers erect. Perianth-tube long, broadly funnel shaped, pulvinate at the throat. Seeds winged at the base.—*Cape*. [11]

23. CYRTANTHUS.—Perianth-tube 2—3 times longer than the oblong segments, naked at the throat. Spathe-valves 2-4.—*Cape, Angola*. [20]

†† *Ovules 2, basal, collateral; testa pale.*

24. GRIFFINIA.—Flowers lilac, umbellate. Leaves broad, thin, petioled.—*Brazil*. [7]

††† *Ovules 2 or few, collateral or fascicled from the centre of the placenta.*

25. CLIVIA.—Fruit baccate. Ovules several. Bulb imperfect.—*Cape*. [11]

26. HÆMANTHUS.—Fruit baccate. Ovules 2. Bulb large, tunicated. Flowers very numerous; segments narrow.—*Cape, Trop. Africa, Socotra*. [38]

27. BUPHANE.—Fruit capsular. Spathe-valves 2.—*Cape, Trop. Africa*. [2]

†††† *Ovules few or many, superposed. Seeds few, green, turgid.*

Fruit indehiscent or bursting irregularly.

28. CRINUM.—Perianth-tube long. Flowers white, sometimes flushed or keeled with red.—*Cosmopolitan*. [79]

29. AMARYLLIS.—Perianth-tube short; segments broad.—*Cape*. [11]

30. AMMOCHARIS.—Perianth-tube short; segments narrow, acute.—*Cape*. [11]

Fruit a 3-valved capsule.

31. BRUNSVIGIA.—Style filiform. Capsule turbinate, acutely angled.—*Cape*. [10]

32. NERINE.—Style filiform. Capsule globose, obtusely angled.—*Cape*. [10]

33. STRUMARIA.—Style swollen and triquetrous towards the base.—*Cape*. [4]

Tribe 3. PANCRAEÆ.—Corona none. Stamens appendiculate towards the base, often united in a distinct cup.

* *Ovules many or few, superposed.*

† *Leaves broad, petioled.*—*All Andine.*

34. EUCROSIA.—Perianth funnel-shaped, coloured; tube short. Stamens declinate, exserted, irregularly connate and callose at the base. [1]

35. STRICKLANDIA.—Perianth funnel-shaped, coloured. Stamens straight, just exserted, united in the lower half, callose at the base. [1]

36. CALLIPSYCHE.—Perianth funnel-shaped, coloured; tube short. Stamens declinate, much exserted, free, callose at the base. [3]

37. PHÆDRANASSA.—Perianth coloured, subcylindrical; segments long or short. Filaments very obscurely appendiculate towards the base. [5]

38. URCEOLINA.—Perianth coloured; tube cylindrical, suddenly dilated. Filaments very obscurely appendiculate towards the base. [3]

39. EUCHARIS.—Perianth white, regular, subrotate; tube subcylindrical, suddenly dilated. Filaments quadrate, united in a distinct cup. [5]

40. PLAGIOLIRION.—Perianth white; tube short, cylindrical; limb rather irregular. Filaments united in a toothed cup. [1]

41. CALLIPHRURIA.—Perianth white; tube funnel-shaped; segments oblong, as long as the tube. Filaments quadrate, with a large tooth on each side of the anther. [2]

†† *Leaves linear or lorate, sessile.*

42. EUSTEPHIA.—Perianth coloured, subcylindrical; tube short. Filaments with a narrow wing on each side, ending in a tooth.—*Andes of Peru.* [1]

43. STENOMESSON.—Perianth coloured, subcylindrical; tube long. Filaments united in an entire or toothed cup.—*Andes.* [11]

44. HYLINE.—Perianth white; tube none; segments linear. Staminal cup very short.—*Brazil.* [1]

45. PANCRACTIUM.—Perianth white; tube funnel-shaped. Staminal cup large.—*Old World.* [12]

** *Ovules 2-6, basal, collateral.*

46. HYMENOCALLIS.—Perianth-tube long. Staminal cup erect.—*Tropical & Subtropical America.* [31]

47. ELISENA.—Perianth-tube short. Staminal cup deflexed.—*Andes.* [3]

*** *Ovules 2-3, medial.*

48. VAGARIA.—Perianth funnel-shaped; segments narrow. Leaves lorate. Ovary 3-celled.—*Syria.* [1]

49. EURYCLES.—Perianth with a slender tube and broad segments. Leaves broad, petioled. Ovary 3-celled.—*Malaya, Australia.* [2]

50. CALOSTEMMA.—Perianth funnel-shaped. Ovary 1-celled. Leaves various.—*Australia.* [3]

Suborder II. ALSTRÆMERIÆ.—Root of fleshy fibres; rootstock none (except in *Ixiolirion*. Inflorescence a simple or compound umbel. Flowering stems leafy.

* *Rootstock bulbous.*

51. IXIOLIRION.—Perianth-segments subequal. Stem erect.—*Western Asia.* [2]

** *Rootstock none.*

52. ALSTRÆMERIA.—Three outer segments of perianth different from three inner, and the latter unequalled. Stem erect. Ovary 3-celled.—*Brazil, Chili.* [44]

53. BOMAREA.—Three outer segments of perianth different from three inner, the latter equal. Stem usually elongated, sarmentose. Ovary 3-celled.—*Mexico, S. America.* [75]

54. LEONTOCHIR.—Segments of perianth subequal. Ovary 1-celled.—*Chili.* [11]

Species of The Genus *Hippeastrum* According to Baker.HIPPEASTRUM *Herb.*¹

Perianth funnel-shaped, usually more or less declinate; tube usually short, rarely long, often furnished with minute scales or a distinct neck at the throat; segments nearly equal or the lowest of the inner row narrower. *Stamens* inserted at the throat of the tube, more or less declinate; filaments filiform; anthers linear or linear-oblong, versatile. *Ovary* 3-celled; ovules many, superposed; style long, declinate; stigma capitate or trifid. *Capsule* globose, loculicidally 3-valved. *Seeds* usually flattened, with a thin black testa.—*Rootstock* a bulb with membranous tunics. *Leaves* linear or lorate. *Peduncle* hollow. *Flowers* usually 2 or more in an umbel, rarely solitary, but if so, the spathe is bifid down to the base, and the pedicel furnished at the base with a linear bracteole. *Flowers* usually bright red or whitish.

* *Leaves linear.*

Subgenus 1. HABRANTHUS (*Herb.*).—Perianth openly funnel-shaped; tube short. Stigma trifid.

Umbel 1-2-flowered	Sp. 1-5.
Umbel 3-6-flowered	Sp. 6-10.

Subgenus 2. PHYCELLA (*Lindl.*).—Perianth narrowly funnel-shaped; tube short. Sp. 11-13.

Subgenus 3. RHODOPHIALA (*Presl.*).—Perianth openly funnel-shaped; tube short. Stigma capitate.

Umbel 1-flowered	Sp. 14-16.
Umbel 2-6 flowered	Sp. 17-18.

** *Leaves lorate.*

Subgenus 4. MACROPODASTRUM.—Perianth with a long tube. Stigma capitate. Sp. 19.

Subgenus 5. OMPHALISSA (*Salisb.*).—Perianth with a short tube, closed in by a distinct neck at the throat.

Stigma trifid	Sp. 20-23.
Stigma capitate	Sp. 24-25.

Subgenus 6. ASCHAMIA (*Salisb.*).—Perianth with a short tube, not closed in at the throat. Stigma capitate.

Perianth-tube very short	Sp. 26-32.
Perianth-tube $\frac{1}{2}$ -1 in. long	Sp. 33-35.

Subgenus 7. LAIS (*Salisb.*).—Perianth-tube short, not closed in at the throat. Stigma trifid. Sp. 36-38.

Subgenus HABRANTHUS.

1. H. SORATENSE Baker.—Bulb ovoid, under 1 in. diam. Leaves about 4, narrow linear, 10-12 in. long, contemporary with the flowers in September. Peduncle slender, 4 in. long. Umbel 2-flowered; spathe-valves 2, linear, 3 in. long; pedicels $\frac{3}{4}$ -1 in. long. Perianth-limb erect, 4-4 $\frac{1}{2}$ in. long; tube 3 in. long, funnel-shaped at the apex, cylindrical below it; segments oblong-lanceolate, 1 $\frac{1}{4}$ in. long, $\frac{1}{4}$ in. broad at the middle. Stamens as long as the segments; anthers $\frac{1}{4}$ in. long. Style deeply trifid.

Hab. Andes of Bolivia; Sorata, alt. 8000—9000 ft., Mandon!

¹ See Baker in Journ. Bot. 1879, 79.

2. H. CHILENSE Baker in Journ. Bot. 1878, 82. *Habranthus chilensis* Herb. *Amaryllis chilensis* R. & P.—Bulb globose, 1-1½ in. diam.; neck 1-3 in. long; tunics dull brown. Leaves about 2, narrow linear, contemporary with the flowers, 6-9 in. long. Peduncle 6-9 in. long. Umbel mostly 2-flowered; spathe-valves linear, 1½ in. long; pedicels ½-1 in. long. Perianth-limb erect or ascending, 1½-2 in. long; tube very short; segments bright red or yellow, oblong, acute, 1/3 in. broad at the middle. Stamens shorter than the perianth-segments; anthers oblong, ⅛ in. long. Style reaching to the tip of the segments; stigma trifid.

Hab. Sandy plains of South Chili, **Pavon! Lesson! Reed!** Flowers in spring.

3. H. ROSEUM Baker in Journ. Bot. 1878, 82. *Habranthus roseus* Herb.; Sweet, Brit. Flow. Gard. ser. 2, t. 107. *H. pumilus* Lodd. Bot. Cab. t. 1771. *Zephyranthes purpurea* Philippi.—Bulb ovoid, under 1 in. diam.; neck short; tunics dark brown. Leaves about 3, contemporary with the flowers in summer, narrow linear, glaucous, a foot long. Peduncle slender, ½ ft. long. Flower usually solitary, nearly horizontal; spathe 2-valved, 1-1½ in. long; pedicel shorter than the spathe. Perianth-limb 2 in. long, bright red; tube very short, greenish; segments oblong-lanceolate, acute. Stamens shorter than the segments; anthers ⅛ in. long. Style longer than the stamens; stigma trifid.

Hab. Chili, **Reed!** Introduced into cultivation from the Island of Chiloe by Lieut. Barlow in 1831, but now lost.

4. H. LINEATUM Baker in Journ. Bot. 1878, 82. *Habranthus lineatus* Philippi.—Bulb and leaves unknown. Peduncle slender, ½ ft. long. Umbel 2-flowered; spathe-valves linear, above 2 in. long; pedicels half as long as the spathe-valves. Flowers cernuous, yellow, marked with red lines, 1½-2 in. long; tube ¼ in. long; segments oblanceolate, 1/3 in. broad. Stamens much shorter than the segments. Style shorter than the segments; stigma trifid.

Hab. Chili, near Santiago, **Philippi.** Flowers in September.

5. H. BRACHYANDRUM Baker.—Bulb and leaves not seen. Peduncle slender, a foot long. Umbel 1-flowered; spathe-valves linear, 2 in. long; pedicel as long as the spathe. Flower nearly erect, bright red, 3½ in. long; tube short, funnel-shaped; segments oblong-lanceolate, acute, ½ in. broad. Stamens under an inch long. Style reaching halfway up the flower; stigma deeply trifid.

Hab. On the Parana, lat. 26—27° S., **Parodi!** Received at Kew in 1883, a dried specimen.

6. H. ADVENUM Herb. App. 31. *Amaryllis advena* Gawl. in Bot. Reg. t. 849; Bot. Mag. t. 1125. *Habranthus hesperius* Herb. *H. mendocinus* Philippi. *Eustephia Macleanica* Baker in Ref. Bot. t. 332, non Herb. *Chlidanthus Cumingii* Presl.—Bulb ovoid, 1½ in. diam.; neck short; tunics dark brown. Leaves linear, a foot long, glaucous green. Peduncle ½-1 ft. long. Umbel 2-6-flowered; spathe-valves lanceolate, 1½-2 in. long; pedicels 1-3 in. long. Flowers horizontal or ascending, openly funnel-shaped, 1½-2 in. long, yellow or red; tube very short, greenish, crenulate at the throat; segments oblong-lanceolate, acute, ¼ in. broad. Stamens declinate, much shorter than the perianth; anthers ⅛ in. long. Style exceeding the stamens; stigma trifid. Var. *pallidus* Herb.; Lodd. Bot. Cab. t. 1760, has pale yellow flowers. *Habranthus miniatus* D. Don in Sweet Brit. Flow. Gard. ser. 2, t. 213, has large bright red flowers.

Hab. Chili, about Valparaiso, Santiago, &c., flowering in December and January. First figured by Feuillee in 1714.

7. H. BIFIDUM Baker in Journ. Bot. 1878, 83. *Habranthus bifidus* Herb. in Bot. Mag. t. 2599.—Bulb globose, 1½ in. diam.; tunics dark brown; neck 2-3 in. long. Leaves 2-3, linear, slightly glaucous, a foot long, produced after the flowers. Peduncle slightly compressed, a foot long. Umbel 3-6-flowered; spathe-valves lanceolate, 2-3 in. long; pedicels slender, 1-2 in. long. Flowers bright red, erect or suberect, about 2 in. long; tube very short, coronulate at the throat; segments oblanceolate-unguiculate, obtuse, cuspidate, ¼-1/3 in. broad. Stamens declinate, unequal, about half as long as the limb; anthers ⅛ in. long. Style longer than the stamens; stigma trifid.

Hab. Plains of Buenos Ayres and Monte Video. Introduced by Lord Carnarvon about 1825. Flowers in March. I cannot separate as species *Habranthus kermesinus* Herb. (Bot. Reg. t. 1638). *H. intemedius* Herb. (Bot. Reg. t. 1148). *H. nobilis*, *nemoralis*, *spathaceus*, *angustus* (Bot. Mag. t. 2639), *pulcher*, and *pendunculatus* Herb. Received alive lately from Colonel Trevor Clarke and Miss F. Hall, of Paddington. A closely allied plant gathered by Jameson and Colonel Hall in the Andes of Ecuador will probably prove a distinct species.

8. *H. BAGNOLDI* Baker in Journ. Bot. 1878, 83. *Habranthus Bagnoldi* Herb. in Bot. Reg. t. 1396.—Bulb globose, 2 in. diam.; tunics nearly black. Leaves linear, glaucous, a foot long. Peduncle slender, a foot long. Umbel 4-6-flowered; spathe-valves lanceolate, 2 in. long; pedicels finally 2-3 in. long. Flowers erect or sub-erect, openly funnel-shaped, $1\frac{1}{2}$ -2 in. long, yellow, tinged with red; tube very short, funnel-shaped, coronulate at the throat; segments oblong, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad. Stamens rather shorter than the perianth-limb; anthers $\frac{1}{6}$ in. long. Style as long as the perianth; stigma trifid.

Hab. Chili, near Coquimbo, **Cuming** 865! Var. **Gilliesianus** Herb., from Melocoton, has smaller flowers than the type, pale yellow, with shorter pedicels. *H. punctatus* Herb., collected by Reynolds in South Chili, has copious small reddish dots on the flower-segments.

9. *H. BERTEROANUM* Baker in Journ. Bot. 1878, 83. *Hippeastrum Berteroanum* Philippi.—Leaves and bulb unknown. Peduncle 9-12 in. long. Umbel 5-6-flowered; spathe-valves lanceolate, $1\frac{1}{2}$ -2 in. long; pedicels sometimes as long. Flowers purple, unspotted, openly funnel-shaped, $2\frac{1}{4}$ in. long; tube very short, minutely squamulose at the throat; segments oblanceolate, $\frac{1}{3}$ in. broad. Stamens much shorter than the flower.

Hab. Chili; Rancagua, flowering in January, **Bertero**.

10. *H. JAMESONI* Baker in Journ. Bot. 1878, 83.—Bulb and leaves not seen. Peduncle slender, $\frac{1}{2}$ ft. long. Umbel 2-4-flowered, spathe-valves lanceolate, $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long; pedicels shorter than the spathe. Flowers horizontal, ascending or cernuous, red, 2 - $2\frac{1}{2}$ in. long; tube very short, funnel-shaped; segments oblong, acute, $\frac{1}{2}$ in. broad at the middle; lower inner narrower. Stamens declinate, unequal, about half as long as the segments. Style rather longer than the stamens; stigma trifid.

Hab. Argentine Republic; ravines near Jachal, flowering in February, **Jameson**!

Subgenus PHYCELLA.

11. *H. PHYCELLOIDES* Baker in Journ. Bot. 1878, 83. *Habranthus phycelloides* Herb. in Bot. Reg. t. 1417.—Bulb ovoid, $1\frac{1}{2}$ -2 in. diam.; neck about 2 in. long. Leaves 3-4, narrow linear, glaucous, contemporary with the flowers. Peduncle $\frac{1}{2}$ -1 ft. long. Umbel 3-6-flowered; spathe-valves linear, 2-3 in. long; pedicels $1\frac{1}{2}$ -2 in. long. Flowers erect or ascending, bright red, yellowish inwards; tube $\frac{1}{3}$ in. long, with a minute ciliated corona at the throat; segments oblanceolate, $\frac{1}{3}$ in. broad, connivent except at the tip. Stamens as long as the perianth; anthers $\frac{1}{6}$ in. long. Style exserted; stigma minutely tricuspidate.

Hab. Andes of Chili, **Macrae**! **Reed**! Introduced into cultivation in 1830. Connects the subgenera *Habranthus* and *Phycella*.

12. *H. BICOLOR* Baker in Journ. Bot. 1878, 83. *Amaryllis bicolor* R. & P. *A. cyrtanthoides* Sims in Bot. Mag. t. 2399. *A. igena* Lindl. Bot. Reg. t. 809. *Phycella ignea*, *cyrtanthoides*, *magnifica*, *graciliflora*, *attenuata*, *brevituba*, *bicolor*, and *biflora* Herb. (Bot. Reg. t. 1943). *P. angustifolia* Philippi.—Bulb globose, 2 in. diam.; tunics dark brown; neck 1-2 in. long. Leaves about 4, contemporary with the flowers, linear, obtuse, $1\frac{1}{2}$ -2 ft. long, about $\frac{1}{2}$ in. broad, narrowed to the base. Peduncle slender, terete, 1- $1\frac{1}{2}$ ft. long. Umbel 4-9-flowered; spathe-valves lanceolate, 1- $1\frac{1}{2}$ in. long; pedicels slender, as long as the spathe. Flowers ascending, narrowly funnel-shaped, $1\frac{1}{2}$ -2 in. long, bright red, passing into yellowish green towards the base; tube short, funnel-shaped, appendiculate with 6 minute teeth at the throat; segments oblanceolate, with a long claw, connivent, $\frac{1}{3}$ in. broad near the tip. Stamens unequal, declinate, nearly as long as the segments. Style exserted; stigma capitate.

Hab. Frequent in Chili, about Valparaiso, &c., flowering in October. I cannot make out any specific characters to separate the synonyms above cited. The finest variety is **P. magnifica** Herb., which has a perianth-limb 3 in. long.

13. *H. HERBERTIANUM* Baker in Journ. Bot. 1878, 83. *H. andinum* Baker. *Phycella Herbertiana* Lindl. in Bot. Reg. t. 1341. *Rhodophiala? andina* Philippi.—Bulb globose, $1\frac{1}{2}$ in. diam. Leaves 3-4, contemporary with the flowers, $1-1\frac{1}{2}$ in. long, $\frac{1}{2}$ in. broad. Peduncle slender, a foot long. Umbel 4-6-flowered; spathe-valves lanceolate, 2 in. long; pedicels slender, $1-1\frac{1}{2}$ in. long. Flowers bright red, suberect, narrowly funnel-shaped, above 2 in. long; tube very short; segments oblanceolate, acute, $\frac{1}{4}$ in. broad above the middle. Stamens as long as the segments; anthers $1/6-1/4$ in. long. Style exserted; stigma capitate.

Hab. Chili; Cordilleras of Santiago, **Philippi!** Introduced into cultivation by Macrae in 1825, but now lost.

Subgenus RHODOPHIALA.

14. *H. MODESTUM* Baker in Journ. Bot. 1878, 83. *Rhodophiala modesta* Philippi.—Bulb ovoid, $\frac{1}{2}$ in. diam.; tunics grey; neck 1-2 in. long. Leaves 2-3, narrow linear, developed after the flowers. Peduncle very slender, 1-flowered, protruded only about an inch from the neck of the bulb, Spathe of 2 linear valves $\frac{1}{2}$ in. long. Pedicel erect, $\frac{1}{4}$ in. long. Flower erect; tube very short; segments oblanceolate, acute, under 1-12th in. broad, white, with a broad red keel. Stamens rather shorter than the segments. Style as long as the limb; stigma capitate.

Hab. Andes of Chili; Cuerta de los Molles, **Philippi!**

15. *H. RHODOLIRION* Baker in Journ. Bot. 1878, 84. *Rhodolirion andinum* Philippi.—Bulb and leaves unknown. Peduncle 1-flowered, $1\frac{1}{2}$ ft. long. Spathe-valves lanceolate, $1\frac{1}{2}-2$ in. long; pedicel $\frac{3}{4}$ in. long. Perianth bright red, openly funnel-shaped, 3 in. long; tube greenish, $\frac{3}{4}$ in. long. Stamens half as long as the limb. Style overtopping the stamens; stigma capitate.

Hab. Chili; Andes of the Province of St. Fernando, **Bustillos.**

16. *H. UNIFLORUM* Baker in Journ. Bot. 1878, 83. *Rhodolirion montanum* Philippi.—Bulb globose, $1\frac{1}{2}$ in. diam.; neck 2-3 in. long. Leaves linear, developed after the flowers. Peduncle 1-flowered, 2-4 in. long; spathe-valves linear, an inch long; pedicel very short. Flower erect, red, about 2 in. long; tube funnel-shaped, above $\frac{1}{2}$ in. long; segments oblong, acute, $\frac{1}{2}$ in. broad at the middle. Stamens half as long as the limb. Style erect, overtopping the stamens; stigma capitate.

Hab. Chili; Cordilleras of Santiago, **Philippi!** Judging from the description, *Rhodophiala uniflora* Philippi, from the Province of Atacama, differs from this by its shorter tube, which is only as long as the ovary.

17. *H. MONTANUM* Baker in Journ. Bot. 1878, 83. *Habranthus montanus* Philippi.—Leaves linear, $1/6$ in. broad. Peduncle 9-12 in. long. Umbel 2-4-flowered; spathe-valves lanceolate, $1\frac{1}{2}$ in. long; pedicels rather shorter. Perianth an inch long, openly funnel-shaped, yellow; segments reflexing towards the tip. Stamens straight, slightly shorter than the perianth. Style just exserted; sigma faintly 3-lobed.

Hab. Chili; Province of Talca; Cordillera of St. Francisco, **Philippi.**

18. *H. PRATENSE* Baker in Journ. Bot. 1878, 84. *Habranthus pratensis* Herb.; Bot. Reg. 1842, t. 35. *Rhodophiala amarylloides* Presl. *Placea pratensis* Poepp. *Stephanoma elegans* Kunze. *Habranthus speciosus* Herb.—Bulb ovoid, $1\frac{1}{4}-1\frac{1}{2}$ in. diam.; neck short; tunics dark brown. Leaves linear, contemporary with the flowers in spring, $1-1\frac{1}{2}$ ft. long, $\frac{1}{4}-\frac{1}{2}$ in. broad. Peduncle moderately stout, 1-2 ft. long. Umbel 2-4-flowered; spathe-valves lanceolate, 2 in. long; pedicels $1-1\frac{1}{2}$ in. long. Flowers bright red, ascending or horizontal; tube very short, appendiculate at the throat with minute linear scales; segments $2\frac{1}{2}$ in. long, oblanceolate, $\frac{1}{2}$ in. broad above the middle, subobtus. Stamens declinate, more than half as long as the limb; anthers linear-oblong. Style declinate, as long as the limb; stigma capitate.

Hab. Hills and plains of Chili, introduced into cultivation about 1840. Received in 1872 alive from Mr. Tyerman. I cannot separate specifically *Rhodophiola Volckmanni* and *R. læta* Philippi, the latter a plant of the hills of Atacama.

Subgenus MACROPODASTRUM.

19. *H. SOLANDRIFLORUM* Herb. App. 31; Bot. Mag. t. 2573 & 3771; Lindl. Collect. t. 11; Lodd. Bot. Cab. t. 1200.—Bulb ovoid, 3-4 in. diam.; neck short. Leaves lorate, 1½ ft. long, above an inch broad. Peduncle slightly 2-edged, 1½-2 ft. long. Umbel 2-4-flowered; spathe-valves lanceolate, 2-3 in. long; pedicels 1-1½ in. long. Perianth-limb funnel-shaped, 7-10 in. long; tube greenish-cylindrical, 4-5 in. long; segments greenish white, obovate, 4-5 in. long, 1-1½ in. broad. Stamens shorter than the segments; anthers linear-oblong. Style as long as the segments; stigma capitate.

Hab. North Brazil, **Burchell**! **Gardner** 3477! Guiana, **Schomburgk** 700! **Appun** 2328! Venezuela, **Fendler** 1505! Colombia, **Lehmann** 2140! Flowers in January. Introduced into cultivation in 1820.

Subgenus OMPHALISSA.

20. *H. AULCIUM* Herb. App. 31. *Amaryllis aulica* Gawl. in Bot. Mag. t. 3311; Bury, Hexand. t. 19; Lindl. in Bot. Reg. t. 444, 1038.—Bulb ovoid, 3 in. diam.; neck short. Leaves 6-8, lorate, bright green, 1½ ft. long, 1½-2 in. broad. Peduncle stout, terete, 1½ ft. long. Umbel generally 2-flowered; spathe-valves lanceolate, red-brown, 3-4 in. long; pedicels 1½-2 in. long. Perianth-limb 5-6 in. long; tube short, with a distinct incurved green corona at the throat; segments bright crimson, green at the base; outer segments and lowest inner about an inch broad above the middle; 2 upper inner much broader. Stamens shorter than the segments; filaments bright red; anthers ½-¾ in. long. Style as long as the segments; stigma deeply trifid. Var. *stenopetalum* Bot. Reg. t. 444, has all the segments much narrower than in the type.

Hab. Central Brazil, **Gardner** 5210! **Regnell** 440! **Weir** 314! Introduced into cultivation in 1819. I cannot distinguish as species *H. Heuserianum* Karst. Fl. Columb. t. 102, gathered by Dr. Heuser at St. Paulo, *H. robustum* A. Dietr. or *Amaryllis Rougieri* Carriere in Rev. Hort. 1882, 312, with coloured figure. A form gathered by Balansa in Paraguay (529) has segments only ½—¾ in. broad.

21. *H. ORGANENSE* Hook. in Bot. Mag. sub t. 3803. *Amaryllis aulica* var. *glaucophylla* Bot. Mag. t. 2983. *A. Gardneri* Seubert. *A. correiensis* Bury, Hexand. t. 9.—Bulb large; neck short. Leaves 5-6, lorate, glaucous, 1-1½ ft. long, 1½ in. broad, acute. Peduncle stout, 1½ ft. long. Umbel generally 2-flowered; spathe-valves lanceolate, 3-4 in. long; pedicels much shorter than the spathe. Perianth-limb 5-6 in. long; tube ½ in. long, funnel-shaped, with a small incurved green corona at the throat; segments bright crimson, with a green keel in the lower half, oblong, acute; outer 1½-1¾ in. broad at the middle; inner lower much narrower. Stamens nearly as long as the segments; filaments bright red; anthers linear-oblong, 1/3 in. long. Style as long as the segments; stigma deeply trifid.

Hab. South Brazil; Organ Mountains, alt. 4000—5000 ft., **Bowie** and **Cunningham**! **Gardner** 686! 688! **Glaziov** 8992! Closely allied to *H. aulicum*.

22. *H. PSITTACINUM* Herb. App. 31. *Amaryllis psittacina* Gawl. in Bot. Reg. t. 199; Lodd. Bot. Cab. t. 1204; Bury, Hexand. t. 23.—Bulb 3-4 in. diam.; neck produced. Leaves 6-8, lorate, glaucescent, 1-1½ ft. long, 1-1½ in. broad. Peduncle stout, 2-3 ft. long. Umbel 2-4-flowered; spathe-valves lanceolate, longer than the pedicels. Perianth-limb 4-5 in. long; tube very short, broadly funnel-shaped, with a distinct incurved greenish red corona; segments oblong, acute, undulated, 1-1¼ in. broad, with a crimson edge, a green keel, and crimson stripes radiating from the keel. Stamens much shorter than the limb. Style shorter than the limb; stigma trifid.

Hab. South Brazil, introduced into cultivation in 1814. Flowers in spring. *H. Griffini* Herb. (Bot. Mag. t. 3528) is a fine hybrid between *psittacinum* and *Johnsoni*.

23. *H. CALYPTRATUM* Herb. App. 31. *Amaryllis calyptrata* Gawl. in Bot. Reg. t. 164; Lodd. Bot. Cab. t. 864. *A. fulvovirens* Schott. *A. unguiculata* Morren.—Bulb globose, 3 in. diam.; tunics brown; neck short. Leaves 5-6, lorate, acute, bright green, 1½-2 ft. long, 2 in. broad. Peduncle terete, green, 2 ft. long, ½-¾ in. diam. Umbel 2-3-flowered; spathe-valves lanceolate, 3 in. long; pedicels shorter than the spathe. Perianth-limb 4 in. long; tube funnel-shaped, ¾ in. long, with a distinct incurved corona at the throat; segments oblong-unguiculate, acute, 1¼-1½ in. broad, pale yellow, reticulated on the face with cross-bars of green. Stamens exserted; anthers linear-oblong, 1/3 in. long. Style exserted; stigma deeply trifid.

Hab. Brazil, **Gardner** 687! Introduced in 1816. Described from a plant flowered by Messrs. Veitch in May, 1877.

24. *H. CYBISTER* Benth. in Gen. Plant. iii. 725. *Sprekelia Cybister* Herb. in Bot. Reg. 1840, t. 33; Bot. Mag. t. 3872; Flore des Serres, t. 455-6.—Bulb ovoid, brown, 2 in. diam. Leaves produced after the flowers, lorate, green, 1-1¼ in. broad. Peduncle above 2 ft. long, glaucescent, subterete, purple downwards. Umbel 4-6-flowered; spathe-valves lanceolate, reddish; pedicels stout. Perianth-limb 3-4 in. long; tube very short, with an incurved bearded neck at the throat; segments bright crimson, tinged with green towards the tip and outside, narrowed gradually from near the base to the acute point, the three upper twisted up, the three lower close together. Stamens 1-1½ in. longer than the segments; filaments greenish; anthers oblong, ¼ in. long. Stigma small, minutely 3-lobed.

Hab. Andes of Bolivia. Introduced into cultivation about 1840, but now lost. Connects *Sprekelia* and *Hippeastrum*.

25. *H. PARDINUM* Dombrain in Floral Mag. t. 344. *Amaryllis pardina* Hook. fil. In Bot. Mag. t. 5645.—Bulb globose, 2-3 in. diam.; neck short. Leaves 5-7, fully developed after the flowers, lorate, bright green, finally 2 ft. long, 2 in. broad at the middle, narrowed to 1 in. near the base. Peduncle glaucous, subterete, 1½ ft. long. Umbel generally 2-flowered; pedicels 1½-2 in. long; spathe-valves lanceolate, 2 in. long. Perianth-limb 4 in. long; tube funnel-shaped, under ½ in. long, with a distinct incurved greenish yellow fimbriated corona at the throat; segments oblong-unguiculate, acute, 1½-1¾ in. broad above the middle, greenish, more or less flushed and copiously minutely spotted with red, not vittate, upper broader and lowest inner narrower than the others. Stamens declinate, a little shorter than the segments; anthers ½ in. long. Style as long as the segments; stigma faintly 3-lobed.

Hab. Andes of Peru; discovered by Pearce; first flowered by Messrs. Veitch in 1867. Described from a plant that flowered at Kew in February, 1882, and a specimen received from M. André the same year.

Subgenus ASCHAMIA.

26. *H. ANDREANUM* Baker in Gard. Chron. 1880, ii. 424.—Bulb 4-4½ in. diam., copiously proliferous; tunics brownish grey; neck short. Leaves lorate, developed after the flowers. Peduncle 12-15 in. long, brownish violet, slightly 2-edged. Umbel 4-6-flowered; spathe-valves 2, rose-red, lanceolate, 1½-2 in. long; pedicels 1-1½ in. long. Perianth-limb 4 in. long; tube very short, not coronulate at the throat; segments oblanceolate-oblong, acute, ½-¾ in. broad above the middle, pale red, with streaks of brighter red, not vittate nor distinctly keeled. Stamens 1-1½ in. shorter than the limb. Style longer than the stamens; stigma capitate.

Hab. Central Cordilleras of New Granada, alt. 6000—8000 ft., on the banks of one of the branches of the Rio Cauca. Discovered by M. André in 1876.

27. *H. REGINÆ* Herb. App. 31. *H. regium* Herb. *Amaryllis Reginæ* L.; Miller, Ic. t. 24; Bot. Mag. t. 453; Red. Lil. t. 9; Bury, Hexand. t. 24.—Bulb globose, 2-3 in. diam. Leaves fully developed after the flowers, 2 ft. long, 1½ in. broad at the middle, narrowed gradually to ½ in. near the base. Peduncle 1-1½ ft. long. Umbel 2-4-flowered; spathe-valves lanceolate, 2-3 in. long, equalling the pedicels. Perianth-limb bright red, 4-5 in. long; tube funnel-shaped, 1/3-½ in. long; throat with a large greenish white star; segments obovate, acute, 1-1¼ in. broad at the middle; lowest inner narrower. Stamens shorter than the limb; anthers yellow, 1/6-¼ in. long. Style as long as the limb; stigma faintly 3-lobed.

Hab. Mexico and West Indies to Brazil and Peru. (Native area doubtful). *H. africanum* Welw. Herb., from "aboriginal woods on Prince's Island, alt. 3500 ft., appears to be a form of this species. *Amaryllis Alberti* Lemaire in Ill. Hort. t. 498, is probably a double-flowered form. Introduced into cultivation in 1728, and called *Lilium Reginæ* by Dr. James Douglas in honour of Caroline, the wife of our George II. I have not seen the Venezuelan *H. prunum* K. Koch, nor the Peruvian *H. stenopetalum* A. Dietr., briefly noticed by K. Koch in Wockenschrift, 1874, p. 37.

28. *H. MINIATUM* Herb. App. 31. *Amaryllis miniata* Ruiz & Pavon.—Bulb ovoid, 2-3 in. diam; neck short. Leaves lorate, 1½-2 ft. long, an inch broad above the middle. Peduncle 1-1½ ft. long. Umbel 2-4-flowered; spathe-valves lanceolate, 2 in. long, pedicels 2-3 in. long. Perianth-limb 3½-4 in. long, bright red; tube ¼ in. long, obscurely coronulate at the throat; segments obovate, sub-acute, 1-1¼ in. broad; inner segments narrower than the outer, especially the lowest. Stamens a little shorter than the limb; anthers linear-oblong, ¼ in. long. Style reaching to the tip of the segments; stigma capitate.

Hab. Andes of Peru, **Pavon!** Quebrada of Pariahuanca, **Matthews**; not known in cultivation.

29. *H. SCOPULORUM* Baker.—Bulb ovoid, 2-2½ in. diam.; neck short. Leaves lorate, narrowed gradually from the middle to the base. Peduncle a foot long. Umbel 2-flowered; spathe-valves lanceolate, 1½-2 in. long; pedicels as long as the spathe. Perianth-limb bright crimson, 2½-3 in. long; tube very short, funnel-shaped; upper outer segment ¾ in. broad at the middle; lower inner ½ in. Stamens as long as the perianth. Style a little exserted; stigma capitate.

Hab. Andes of Bolivia; Sorata, temperate region, alt. 8000—9000 ft. **Mandon** 1193! Allied to *H. Reginae* and *miniatum*.

30. *H. MANDONI* Baker.—Bulb ovoid, 2-3 in. diam. Leaves lorate, 2 ft. long, an inch broad at the middle. Peduncle stout, 1-flowered; spathe-valves lanceolate, 3-4 in. long; pedicel 2 in. long. Flower erecto-patent, bright crimson; perianth-limb 5 in. long; tube greenish, funnel-shaped, ½ in. long; segments obovate, acute, outer 1½ in. broad; upper the longest; inner all above an inch broad. Stamens much shorter than the limb; anthers yellow; ¼ in. long. Style nearly as long as the limb; stigma capitate.

Hab. Andes of Bolivia; near Sorata, temperate region, alt. 8000—9000 ft., **Mandon** 1195! Intermediate in general appearance between *H. Reginae* and *aulicum*. It may be identical with *H. Warszewiczianum* A. Dietr., briefly described by K. Koch, Wochenschrift, 1864, 38.

31. *H. LEOPOLDI* Dombrain in Floral Mag. t. 475-6. *Amaryllis Leopoldi* Moore in Gard. Chron. 1870, 733, fig. 140.—Bulb globose, 2-3 in. diam.; neck short. Leaves lorate, finally 1½-2 ft. long. Peduncle stout, subterete. Spathe-valves lanceolate. Perianth-limb the most regular of all the species, 5 in. long, 6-7 in. diam. when fully expanded; tube short, without any distinct incurved corona at the throat; segments obovate, 2 in. broad, white towards the tip, bright red at the middle, with a bifid white keel in the lower half of the red, and a large greenish white throat. Stamens declinate, rather shorter than the segments; filaments white; anthers purplish, above ½ in. long. Style longer than the stamens; stigma capitate.

Hab. Andes of Peru, discovered by Pearce. First flowered by Messrs. Veitch in 1869, and named in honour of Leopold, King of the Belgians.

32. *H. PROCERUM* Lemaire in Ill. Hort. xi. 408. *Amaryllis procera* Duchartre; Flore des Serres, t. 2077-8. *A. Rayneri* Hook. fil. in Bot. Mag. t. 5883.—Bulb large, ovoid, with a long neck. Leaves about a dozen, distichous, falcate, ensiform, finally 2-3 ft. long, 1½-2 in. broad, firm in texture, cartilaginous on the edge. Peduncle 1-1½ ft. long, much compressed, ancipitous, shorter than the leaves, 1-1¼ in. diam. Umbel 4-12-flowered; spathe-valves 2-3 in. long, exceeding the pedicels. Perianth-limb 5-6 in. long, lilac, not starred at the throat; tube very short; segments oblanceolate, acute, under an inch broad. Stamens much shorter than the limb; anthers yellow, ½ in. long. Stigma capitate.

Hab. South Brazil, near Petropolis. Introduced by Binot about 1863, in which year it was described by Duchartre. Very distinct.

33. *H. EQUESTRE* Herb. App. 31. *Amaryllis equestris* Ait.; Jacq. Hort. Schoen. t. 63; Bot. Mag. t. 305; Red. Lil. t. 32. *A. punicea* Lam. *H. occidentale* Roem. *A. Belladonna* Swartz, non Linn.—Bulb stoloniferous, globose, 2 in. diam.; tunics brown; neck short. Leaves 6-8, fully developed after the flowers, lorate, bright green, 1½ ft. long, 1½-1¾ in. broad, narrowed gradually to the point. Peduncle terete, rather glaucous, 1½-2 ft. long. Umbel 2-4-flowered; spathe-valves green, lanceolate; pedicels 2-3 in. long. Perianth-limb 4-5 in. long, 4 in. diam. when expanded; tube green, an inch long, obscurely coronulate at the throat; base of the segments yellowish green; upper part bright red; 3 outer 1¼-1½ in. broad; 3 inner narrower, especially the lowest. Stamens shorter than the segments; anthers small, oblong. Stigma obscurely 3-lobed.

Hab. Throughout Tropical America from Mexico and the West Indies to Chili and Brazil. Var. **major** Bot. Reg. t. 234; Bury, Hexand. t. 41, is a form with very large flowers. The species was first noticed by Hermann in 1698. Described from plants that flowered at Kew in 1873 and 1879. I cannot find any specific character by which to distinguish *A. Roezli* Regel in Gartenflora, 1874, 290, t. 809, gathered by **Roezl** in the Andes of Bolivia. *H. barbatum* Herb. (*Crinum barbatum* Linn. herb.) is apparently not more than a white-flowered variety of this species. *H. pyrochroum* Lemaire in Ill. Hort. t. 420, and *H. spathaceum* Sims in Bot. Mag. t. 2315, are probably both also varieties.

34. *H. RETICULATUM* Herb. in Bot. Mag. sub t. 2475. *Amaryllis reticulata* L'Herit. Sert. Angl. 12, t. 14; Bot. Mag. t. 657; Andr. Bot. Rep. t. 179; Red. Lil. t. 424. *Coburgia reticulata* Herb. *Leopoldia reticulata* Herb.—Bulb subglobose; neck short. Leaves 4-6, thin, oblanceolate, bright green, 2 in. broad above the middle, narrowed gradually to the base. Peduncle nearly terete, a foot long. Umbel 3-5-flowered; spathe-valves lanceolate, 2 in. long; pedicels 1-1¾ in. long. Perianth-limb 3½-4 in. long; tube ½-1 in. long, not coronulate at the throat; segments obovate-unguiculate, connivent in the lower half, an inch broad at the middle, bright mauve-red, with copious cross-bars of a deeper shade. Stamens shorter than the perianth. Stigma faintly 3-lobed. Seeds fewer and less compressed than in the other species.

Var. *H. STRIATIFOLIUM* Herb. *Amaryllis reticulata* var. *striati-folia* Herb. in Bot. Mag. t. 2513; Bot. Reg. t. 352; Bury, Hexand. t. 48.—Leaves broader, with a distinct white keel. Perianth-segments hardly at all reticulated with cross-bars.

Hab. South Brazil. There is a specimen at the British Museum, dried from the gardens of Messrs. Lee, of Hammersmith, in 1781. It was introduced in 1777. The only indigenous specimens I have seen were gathered by Burchell in March, 1826, on the shores of Botafogo Bay and near the village of Sao Domingas.

35. *H. STYLOSUM* Herb. in Bot. Mag. t. 2278. *Amaryllis stylosa* Bury, Hexand. t. 33. *A. maranensis* Gawl. in Bot. Reg. t. 719. *A. staminea* Seub.—Bulb globose, 3 in. diam. Leaves 4-6, bright green, lorate, 1¼-1½ in. broad. Peduncle 1½ ft. long. Umbel 3-8-flowered; spathe-valves lanceolate; pedicels 1-2 in. long. Perianth-limb 4 in. long, bright flesh-red; tube ½ in. long, obscurely fimbriate at the throat; segments oblong, acute, under an inch broad. Stamens a little exserted; anthers linear-oblong, ¼ in. long. Style much exserted; stigma capitate.

Hab. Guiana and North Brazil, **Burchell** 9819! **Gardner** 1167! Introduced by Lord Carnarvon from Marantham in 1821. Described from a plant flowered by Messrs. Backhouse in May, 1878.

Subgenus LAIS.

36. *H. RUTILUM* Herb. App. 41. *Amaryllis rutila* Gawl. in Bot. Reg. t. 23; Lodd. Bot. Cab. t. 1449. *H. bulbulosum* var. *rutilum* Herb.—Bulb subglobose, stoloniferous, 2-3 in. diam.; neck short; tunics pale. Leaves 6-8, lorate, bright green, a foot long, above an inch broad. Peduncle glaucous, slightly compressed, a foot long. Umbel 2-4-flowered; spathe-valves lanceolate, 1½ in. long; pedicels slender, as long as the spathe. Perianth-limb 3-4 in. long; tube green, cylindrical, ¾ in. long, obscurely coronulate at the throat; segments oblong, acute, bright crimson, with a green keel extending halfway up, ¾-1 in. broad at the middle, the lower inner narrower. Stamens shorter than the segments; filaments red; anthers linear-oblong, ¼ in. long. Style as long as the limb; stigma trifid.

Var. *H. FULGIDUM* Herb. *Amaryllis fulgida* Gawl. in Bot. Reg. t. 226; Bury, Hexand. t. 26. *A. miniata* Sims in Bot. Mag. t. 1943; Bury, Hexand. t. 35, non R. & P. *A. brasiliensis* Tratt. Tab. t. 333. *H. subbarbatum* Herb. in Bot. Mag. t. 2475. *H. bulbulosum*, vars. *subbarbium*, *unguiatum*, *fuigiaum*, *Simsianum*, and *equestriforme* Herb.—More robust. Bulb 3-4 in. diam. Leaves broader. Perianth-limb 4-5 in. long; tube 1 in. long; segments bright scarlet, with a green base and keel in the lower half, more ovate, 3-4 in. long, outer 1-1¼ in., inner lower about ¾ in. broad.

Var. *H. CROCATUM* Herb. *Amaryllis crocata* Gawl. in Bot. Reg. t. 38.—Habit as robust and leaves as broad as in *fulgidum*, but flower smaller, saffron-coloured, with more undulated segments.

Var. *CITRINUM* Baker. *Amaryllis crocata* Bury, Hexand. t. 16.—Flower bright yellow.

Var. *H. ACUMINATUM* Roem. *Amaryllis acuminata* Gawl. in Bot. Reg. t. 534 & 1188. *A. pulverulenta* Lodd. Bot. Cab. t. 484; Bury, Hexand. t. 45. *H. pulverulentum* Herb. in Bot. Mag. t. 2273.—Flowers pale pink; segments very acute.

Hab. South Brazil, especially about Rio Janeiro, **Miers** 3123! 3598! **Glaziou** 8991! **Tweedie**! **Vauthier**! *H. Martianum* and *bahiense* Roem., and *H. glaucescens* Herb. appear to be also varieties of this very variable species. Introduced into cultivation about 1810.

37. *H. VITTATUM* Herb. App. 31. *Amaryllis vittata* Ait.; Bot. Mag. t. 129; L'Herit. Sert. t. 15; Red. Lil. t. 10; Bury, Hexand. t. 32 & 40.—Bulb globose, 2-3 in. diam. Leaves 6-8, lorate, bright green, 1½-2 ft. long. Peduncle 2-3 ft. long. Umbel

2-6-flowered; spathe-valves lanceolate, 2-3 in. long; pedicels as long as the spathe. Perianth-limb 4-6 in. long; tube funnel-shaped, an inch long, obscurely coronulate at the throat; segments obovate-oblong, acute, 1-1½ in. broad, white towards the edge and distinctly keeled with white, striped with bright mauve-red between the keel and edge; expanded limb 3-5 in. diam. Stamens shorter than the perianth-limb; anthers linear-oblong, ¼ in. long. Style as long as the limb; stigma deeply trifid.

Hab. Andes of Peru, introduced into Europe in 1769. There is a specimen at the British Museum dried from the garden of Mr. Malcolm in 1777. Flowers in April and May. It varies much in the size of the flower and distinctness of the stripes. Var. *minor* Bury, Hexand, t. 40, has a perianth 4 in. long. Var. *Harrisoniæ* Lindl. Bot. Reg. t. 988, is probably a hybrid between *vittatum* and *solandriflorum* (Bury, Hexand, t. 27).

38. *H. BREVIFLORUM* Herb. Amaryll. 137, t. 21, fig. 4; Bot. Mag. t. 3549.—Bulb ovoid, 2-3 in. diam. Leaves lorate, green, 1½ ft. long, 1¼-1½ in. broad. Peduncle terete, glaucous, 2-3 ft. long. Umbel 5-6-flowered; spathe-valves lanceolate; pedicels slender, 2-3 in. long. Perianth-limb 2½ in. long, funnel-shaped; tube very short; segments oblanceolate-oblong, subacute, white, keeled with red, the outer ¾ in. broad above the middle, the lowest inner ½ in. Stamens shorter than the limb; anthers small, oblong. Style shorter than the limb; stigma trifid.

Hab. Buenos Ayres, **Tweedie!** First flowered in cultivation at Glasgow in April, 1836.

Hybrids.

The broad-leaved species of *Hippeastrum* hybridise with great facility, and the original hybrids can be easily intercrossed. Since the year 1799, when *H. Reginæ* was first crossed with *H. vittatum* by a watchmaker of Prescott, in Lancashire, called Johnson, after whom the hybrid was named, a very large number of beautiful types have been produced. About 100 of these, with Latin names, are enumerated, and their parentage given in the second edition of Sweet's 'British Flower Garden,' in 1830.* Up to that time the principal species crossed were *Reginæ*, *reticulatum*, *vittatum*, *aulicum*, and *solandriflorum*; and rarely *equestre*, *psittacinum*, *fulgidum*, and *stylosum*. Since 1870 *pardinum* and *Leopoldi* have been largely used, especially the latter. I will only attempt here to enumerate a few of the hybrid types which have been figured or to which Latin names have been given.

Forms nearest *Reginæ*:—*Johnsoni* Bury, Hexand. t. 1; *brasiliensis* Red. Lil. t. 469; *Gravinæ* Melazzo; *Carnarvonia* A. DC. Pl. Rar. Hort. Genev. t. 9; *spectabile* Lodd. Bot. Cab. t. 159.

Forms nearest *aulicum*:—*Ackermanni*; *Ackermanni pulcherrima* Moore, Mag. 1850, ii. 5; *Chelsoni* Floral Mag. t. 545; *Mendeli* Floral Mag. n. s. t. 167; also Floral Mag. t. 97, and new series, tabs. 77, 347, and 359.

Forms nearest *reticulatum*:—*Sweetii*, *Colvillei*, *præclara*, *formosa*, *gloriosa*, and *Goweni*. Recent forms, Flore des Serres, t. 2427; Floral Mag. t. 383, and new series, tabs. 22 and 153.

Forms nearest *solandriflorum*:—Crossed with *vittatum* it gives *ambiguum* Bot. Mag. t. 3542; also forms figured Bot. Reg. t. 876, and Gartenflora, tabs. 949 and 956; also *picta* Bury, Hexand. t. 5, a fine cross with *Johnsoni*, figured Bury, Hexand. t. 46, *Harrisoni* Bury, Hexand. t. 21, and *marginata*, *Croomii*, *Haylocki*, *Herberti*, and *Carnarvoni*.

Vittatum has been largely crossed with the four foregoing species.

Pardinum gives the spotted types in Veitch's recent hybrids. A fine cross between this and *Leopoldi* is figured Gard. Chron. 1877, fig. 136.

Forms near *Leopoldi*:—A form very near the type is *Hendersoni* Floral Mag. n. s. t. 117. The best hybrids recently raised by Mr. Heal for Messrs. Veitch at the present day have an open regular flower, with scarcely any tube and much imbricated segments, derived from *Leopoldi*, combined with a brilliant scarlet colour, probably derived from *Reginæ* through *Johnsoni*.

* See also Herbert, Amaryll. 335; Trans. Hort. Soc. iii. 196, iv. 42; Journ. Hor. Soc. ii. 19; Gowen in Trans. Hort. Soc. iv. 498; Lindley in Trans. Hort. Soc. v. 337; Kunth, Enum. v. 529; Miss Rosenberg's 'Corona Amaryllidacea,' published at Bath in 1839, with coloured plates of five hybrids; Dietrich in Berlin Gartenzeit. 1884, 121; K. Koch, Wochenschrift, 1864, 17, 30, 37; Goldring in Garden, 1883, 193; Douglas in Garden, 1887, 250, t. 614; and G. Don in Sweet. Brit. Flow. Gard. ed. 3, pp. 671-675.

The Genus *Amaryllis* According to Baker.

AMARYLLIS Linn. ex. parte.

Perianth funnel-shaped, with a short tube and 6 subequal oblong acute connivent segments. *Stamens* inserted at the throat of the tube; filaments long, filiform; anthers linear, versatile. *Ovary* 3-celled; ovules many in a cell; style filiform, declinate; stigma capitate. *Capsule* globose, bursting irregularly. *Seeds* like that of a *Crinum*.

The name *Amaryllis* is still universally given in gardens to the species and hybrids of *Hippeastrum*, which has a flower like that of the present plant, but entirely different capsule and seeds.

1. *A. BELLADONNA* Linn. Sp. Pl. 421; Bot. Mag. t. 733; Red. Lil. t. 180. *A rosea* Lam. *A. pudica* Gawl. *Coburgia Belladonna* Herb.—Bulb 3-4 in. diam.; tunics rather fibrous. Leaves 7-9 produced after the flowers, lorate, distichous, dull green, 1-1½ ft. long, under an inch broad. Peduncle solid, compressed, 1-1½ ft. long. Flowers 6-12 in an umbel, produced in March and April at the Cape; pedicels 1-1½ in. long; spathe-valves 2, large, green. Perianth rose-red in the type; tube ½ in. long; segments 2-3 in. long, ½-¾ in. broad above the middle. Capsule globose, 1 in. diam. *A. pallida* Red. Lil. t. 479, differs only by its pale flowers.

Var. *A. BLANDA* Gawl. in Bot. Mag. t. 1450. *Coburgia blanda* Herb.—Leaves more sheathing at the base, longer and broader, reaching 2-3 ft. Flowers larger, lighter in colour, and opening wider; segments 3-4 in. long, 1-1¼ in. broad.

Hab. Southern Provinces of Cape Colony. Introduced into cultivation in 1712. Many forms are named in gardens. Sweet calls the genus **Belladonna**, and admits four species, **B. purpurascens**, **pallida**, **pudica** and **blanda**. See also **purpurascens**, Flore des Serres, t. 911; and **rubra**, Flore des Serres, t. 1415.

COLLECTING CRINUM AMERICANUM & HYMENOCALLIS SPECIES IN THEIR NATIVE FLORIDA HABITAT

WYNDHAM HAYWARD, *Florida*

Brief excursions by motor car into the countryside of Central Florida have resulted in the finding of numerous plants of *Crinum americanum* and a *Hymenocallis* species during the summer and fall of 1933 by the writer in company with Dr. Hamilton P. Traub.

The bulbs are found growing abundantly in muck or muddy ditch banks along the side of the road from Orlando to the East Coast of Florida in the valley of the St. John's River. Groups of the *Crinum* bulbs may often be located by the sight of the chaste white star-like flowers on a scape a foot and a half high. The bulbs are small, about an inch in diameter, with a long neck that comes up through the mud. This makes their digging difficult. Scattered in among the *Crinums* occasionally may be found a few *Hymenocallis* plants, of the same size, but indentifiable by their flat leaves and amaryllis-like character of growth.

An effort will be made during 1934 to identify the species of *Hymenocallis* obtained. The writer also discovered a group of large bulbs of another *Hymenocallis* species, probably *H. caribaea*, with bloom stalks four feet tall, growing in high pine land near Winter Park, Florida, during July 1933. An attempt is also being made to collect *Zephyranthes atamacso*, and *Z. treatieae*.

DESCRIPTION OF NEW VARIETIES

In future issues of the Year Book a limited amount of space will be devoted to the description of new varieties. The entries must be brief and those sending in such items for publication should first fill out the complete descriptive form and then write the brief synopsis. The item sent in should cover only the outstanding distinguishing characters. Color descriptions should conform to the *Fischer Color Chart*.

TENTATIVE DESCRIPTIVE FORM FOR AMARYLLIS (HIPPEASTRUM)*

Approved by the
AMERICAN AMARYLLIS SOCIETY

1. Specific or Hort. name:
2. Parentage, if a hybrid
3. Date introduced 3. By Whom
4. Synonyms
5. Locality
6. Habitat
7. Deciduous or Evergreen 8. Vigor of plant
9. Time of flowering Duration
10. *Bulb*: (a) General shape (b) Dia. in cm.
- (c) length in cm. (d) Other characters
11. *Leaves*: (a) position; upright or drooping
- (b) general shape
- (c) shape in cross section (d) length in cm.
- (e) width at base in cm. (f) width at center in cm.
- (g) width at top in cm. (h) tip pointed or rounded
- (i) color (j) striping
12. *Flower Scape*: (a) length in cm. (b) width in cm.
- (c) color (d) Number of scapes
- (e) No. of flowers per scape (f) Other characters
13. *Flower*: (a) length in cm. (b) tube: long
- tube short, closed at neck tube short, not closed at neck
- (c) width in cm. (d) Position; erect
- Horizontal Drooping
- (e) Perianth segments; narrow broad pointed at tip
-, rounded at tip all equal
- all not equal, lower imperfect other differences
- (f) *Perianth color*: ground minutely dotted,
-, keeled striped
- edged cross bars tipped
- star other color details
- (g) *Pistil*: trifid capitate style color
-, stigma color
- other details
- (h) *Stamens*: Filament color anther color
- other details
- (i) Scent
14. *Propagation*: bulblets, slow rapid
- seed
15. *Cultural Requirements*
16. Other details:
17. *Synopsis* (Give a brief statement of the outstanding and distinguishing characters)

* Report of the Special Committee on Description, Nomenclature and Check List approved by the Board of Directors.

A PRELIMINARY AMARYLLIS (HIPPEASTRUM) CHECK LIST*

This check list of horticultural forms of *Hippeastrum* is a mere beginning, and it is hoped that amaryllis enthusiasts everywhere will add new entries, and will offer additional information on present entries, as well as corrections of errors that have crept in.

AUTHORITIES CONSULTED: The check list is based upon the authorities listed below excepting as indicated in the foot note. The Committee is especially indebted to Mr. F. J. Chittenden of the Royal Horticultural Society, London, who furnished much valuable information.

Authorities

Abbreviations**

Baker, J. G. Handbook of the Amaryllideae Geo. Bell & Sons. London. 1888.....	B
Chittenden, F. J. Royal Horticultural Society, London. Communication dated Oct. 20, 1933	C
†Gartenwelt, Berlin 18... to date	GW
†Gartenezeitschrift, Berlin 18... to	GZ
†Gardeners Chronicle (London)	GC
Herbert, William Amaryllidaceae. James Ridgway & Sons, London. 1837	H.
Houdyshel, Cecil Catalog 193... La Verne, Calif.	Hou.
†Ker, Robert P. & Sons (Liverpool, England) Catalogs (18... to 19...)	K
Nehrling, Henry Die Amaryllis oder Rittersterne (Hippeastrum) Paul Parey. Berlin 1909	N
†Revue Horticole (Paris); 18... to date	RH
†Royal Horticultural Society, London, Journal 18... to date	RHS
†Sweet, British Flower Garden, 1830	S
Veitch, Harry The Hippeastrum (Amaryllis) Journal Royal Hort. Soc. London 12:243-255 1890	VH
†Veitch, James & Sons Chelsea, England Catalogs 18... to date	VJ

Amaryllis Breeders

Introductions by the following amaryllis breeders are included:

<i>England:</i> Griffin (18... to 18...)
Dr. E. Bonavia (18... to 19...)	R. Harrison (18... to 18...)
James O'Brien (18... to 18...)	William Herbert (17... to 18...)
..... Brookes (1..... to 1.....)	Sir G. Holford (18... to 19...)
..... Colvill (18... to 18...) Johnson (17... to 18...)
C. R. Fielder (18... to 18...)	Messrs. Jas. Ker & Sons (18... to 19...)
Messrs. Caraway & Sons (18... to 18...)	Lionel de Rothschild (18...)

* Report of the **Special Committee on Description, Nomenclature and Check List** approved by the Board of Directors.

The suffix (illus.**) after the abbreviation indicates that the variety is illustrated.

†Entries from these authorities are not included in the present report on account of insufficient time; these and still other authorities will be consulted in the preparation of the final report to appear in a future issue of the Year Book.

HAMILTON P. TRAUB, Chairman,
I. W. HEATON

Special Committee on Description, Nomenclature and Check List.

- Baron Schroeder (18....
 Sir Chas. Strickland (17.... to 18....)
 Sweet (17.... to 18....)
 Messrs. Jas. Veitch & Sons
 (18.... to 19....)
 B. S. Williams (17.... to 18....)
France:
 De Candolle (17.... to 18....)
 Eugene Souchet (18.... to 18....)
 Louis Van Houtte (18.... to 18....)
Holland:
 de Graff (18.... to 18....)
- van Seden (18.... to 19....)
Germany:
 Herren Haage & Schmidt (18....
 Frau Anna Jay (18....
Italy:
 Melazzo (17.... to 18....)
America:
 W. Otto Gronen (18.... to 18....)
 Cecil Houdeshel (18....
 Henry Nehrling (1853 to 1929)
 H. Pfister (18.... to 19....)

Order of Arrangement

The order of arrangement is as follows: Name; introducer and year of introduction in parentheses; authorities consulted, indicated by abbreviations, including note on illustrations; synonyms; parentage, if known; full description as far as known; and awards:— *A.M.* indicates Award of Merit, and *F.C.C.* indicates First Class Certificates from the Royal Horticultural Society, London; the name and dates following abbreviations refer to the exhibitor and date of exhibition.

- A. Broginart* (Souchet, 18....) N.; *H. vittatum* hybrid.
Acadia (..... 18.....) N.; "schwefelfarbig, licht rot angeflogen und geädert".
Acramanii (Garaway, 1835) N.; C.; V.H.; Syn. *Ackermani*, *Acramanni*; *H. aulicum platypetalum* X *H. psittacinum*; *A.M.*; Lawrence, July 1, 1930.
Acramanii pulcherrimum (Garaway, 1850); N.; Syn. *Ackermannii pulcherrimum*; *H. aulicum* X *Johnsoni*
Acquisition (Veitch, 1889) C.; *A. M.*; Veitch, March 12, 1889.
Agamemnon (Holford, 1906) C.; *A. M.*; Sir G. Holford, Apr. 3, 1906.
Agneta (....., 18....) N.; orange red, bordered with white.
Alba Rosea Marginata (Ker, 18....) N.; white, all segments veined rose red; *Leopoldi* type.
Alberti N. (illus); Syn. *Hippeastrum alberti* Lemaire; a double form of *H. equestre*.
Allmanni (Colville, 18....) H.; *H. calytratum* X *H. vittatum*; named for the Professor of Botany at Dublin.
Altaclarae (Herbert, 18....) B.; *H. psittacinum* x *Griffini*, named for the estate, Highclere.
Ambignum (,) B.; *H. solandiflorum* x *H. vittatum*.
Andersoni (Herbert, 18....) H.; *H. rutilum* x *H. vittatum*; named for the conductor of the Chelsea Garden.
Andromache (Ker,....) N.; violet red; *Leopoldi* type.
Andromeda (Ker 18....) N.; very light ground with red veins; *Leopoldi* type.
Aphrodite (Ker.....) N.; white, striped and feathered red; *Leopoldi* type.
Apple Blossom (Holford, 1899) C.; see also *Fair Lady*; *A. M.*; Sir G. Holford, Mar. 14, 1899.
Apollo (Ker, 18....) N.; deep carmine red edged white; *Leopoldi* type
Arona (....., 18....) N.; yellow (much like a *Clivia* yellow).
Artemise (Souchet, 18....) N.; *H. vittatum* hybrid.
Aurora (Ker, 18....) N.; light red, strongly veined red; *Leopoldi* type.
Autumn Beauty (Veitch, 18....) N.; V.H.; *H. reticulatum striatifolium* x *H. Leopoldi*; fall blooming.
Autumn Charm (Veitch, 18....) N.; *H. reticulatum striatifolium* x *H. leopoldi*; fall blooming.
Averunicus (Veitch,) N.; C.; orange red, petals border white; *A. M.*; Veitch, April 9, 1901.
Baffin (Souchet, 18....) N.; *H. vittatum* hybrid.
Baroness Schroeder (.....,) C.; *A. M.*; Schroeder, April 24, 1928.
Baron Palles (Williams, 18....) N.; *Defiance* x *H. reticulatum*; fall blooming.
Batemanni (Colville, 18....) H.; *H. reginae* x *H. rutilum*; named for J. Bateman.
Ben Hur (Nehrling, 19....) N.; *H. equestre* x *Empress of India*; light orange red; flower stalk 3¼ ft. high.
Benthami (Herbert, 18....) H.; *H. styl- osum* x *Johnsoni*; flowers of a gloomy but variable red; named for the botanist Bentham; raised at Spofford.
Besson (.....) C.; *A. M.*; Sir G. Holford, March 22, 1898.
Black Beauty (.....) C.; *A. M.* Holford, April 20, 1925.

- Black Prince* (.....) C.; A. M.; Holford, April 7, 1903.
- Braziliensis*; See *Johnsoni*.
- Brenda* (.....) C.; A. M.; Veitch, April 13, 1897.
- Brian Boru* (.....) C.; A. M., Holford, April 3, 1906.
- Brilliant* (Seden) N.; VH.; *H. pardinum* hybrid.
- Brookesi* (Brookes, 18....) H.; *H. rutilum* x *Johnsoni*.
- Calliope* (Ker, 18....) N.; scarlet red, with a rose red sheen; *Leopoldi* type.
- Calphurnia* (....., 18....) N.; rose with white star.
- Calypso* (.....) C.; A. M.; Holford, April 19, 1910.
- Cardinal Wolsey* (.....) C.; A. M.; Holford, April 19, 1910.
- Carminata* (Ker, 18....) N.; a most beautiful new color combination—ground color light rose red, the whole flower sprinkled with red; *Leopoldi* type.
- Carnarvoni* (Herbert, 18....) H.; B.; *H. solandiflorum* x *Johnsoni*; raised at Highclere; named for the brother of William Herbert.
- Carnavonia* (deCandolle, 18....) H.; B.; *H. reginae* x *H. vittatum*.
- Cartoni* (Herbert, 18....) H.; *H. aulicum* x *Sweetii*; named for Carton, the gardener at Highclere.
- Cassandra* (Ker, 18....) N.; red, white veins; *Leopoldi* type.
- Cecelia* (....., 18....) N.; white over a rose scarlet-ground.
- Charles Penny* (.....) C.; A. M.; Hambledon, April 9, 1892.
- Chelsoni* (Sedan.....) N.; VH.; *H. pardinum* hybrid.
- Chimboraso* (.....) C.; A. M.; Holford, Apr. 13, 1897.
- Chimere* (.....) C.; A. M.; Veitch, April 11, 1895.
- Clemence* (Souchet, 18....) N.; *H. vittatum* hybrid.
- Cleopatra* (Van Houtte, 18....) N.
- Cerise Magnificum* (.....) C.; A. M.; Schroeder, Mar. 13, 1928.
- Climax* (..... 18....) N.
- Clonia* (....., 18....) N.; white veined red, A. M.; Veitch, Mar. 22, 1898.
- Clovelly*, (.....) C.; A. M.; Holford, Mar. 26, 1901.
- Colvillii* (Colville, 18....) H.; B.; *H. reticulatum* x *H. reginae*.
- Comte de Germiny* (Williams, 18....) N.; *H. reticulatum* x *Defiance*; fall blooming
- Conquerant* (Souchet, 18....) N.; *H. vittatum* hybrid.
- Corinna* (.....,) C.; A. M.; Veitch; Mar. 14, 1893.
- Cornut* (Ker, 18....) N.; deep rose red, similar to the rose, *General Jacqueminot*; *Leopoldi* type.
- Count Cavour* (Van Seden, 18....) N.
- Creon* (....., 18....) N.; lower petals lilac red; upper veined red.
- Crimson King* (.....,) C.; A. M.; Veitch, April 12, 1892.
- Croomii* (....., 18....) B.; *H. solandri-florum* hybrid.
- Crown Prince of Germany* (....., 18....) N.
- Cupid* (Ker, 18....) N.; unchanging pure white, slightly penciled red; *Leopoldi* type.
- Daones* (.....,) N.; C.; A. M.; Veitch April 12, 1898.
- Daubenii* (Herbert, 18....) H.; *Griffini* x *Johnsoni*; raised at Spofford; named for the botanist at Oxford.
- Defiance* (Van Houtte, 18....) N.
- DeGraff* (DeGraff, 18....) VH.
- Digweedi* (Herbert, 18....) H. *H. reticulatum* x *H. vittatum*; raised at Highclere.
- Daones* (....., 18....) N.; C.; See Doanes; zinnabar red with white edge.
- Donnii* (Herbert, 18....) H.; *Hookeri* x *Haylocki*; a complicated cross raised at Spofford; in most of which the stripe of *H. reticulatum striatifolium* has descended from the first cross; named for the botanist at King's College.
- Dr. Masters* (Williams, 18....) N.; clear red; *H. pardinum* hybrid; *Leopoldi* type.
- Doris* (.....,) C.; A. M.; Veitch, April 11, 1895.
- Duke of York* (.....) C.; A. M.; Holford, April 13, 1897.
- Dulas* (....., 18....) N.; rose, deep red toward center; a small but very beautiful flower.
- Eclatante* (Ker, 18....) N.; red with purple sheen; *Leopoldi* type.
- Eclipse* (....., 18....) N.; C.; strong grower; white with border veined red; A. M.; Veitch; Mar. 22, 1892.
- Edith M. Wynne* (Veitch, 18....) N.; VH.; *H. reticulatum striatifolium* x *leopoldi*; fall blooming.
- Eglamor* (Veitch 18....) N (*illus*).; *Leopoldi* type flower.
- Eldorado*, (.....,) C.; A. M.; Veitch, Mar. 14, 1893.

- Empress of India* (deGraff, 18....) N.; VH.; *H. psittacinum* x *Graveanum*; 4-6 flowers to scape; brilliant color.
- Enchantress* (Veitch, 18...) N.; an old not perfect but very vigorous growing sort; rose red; striped carmine; delightfully scented.
- Eros*, (.....,) C.; A. M.; Veitch, March 24, 1896.
- Esther* (Pfister, 18....) N.; *Dr. Masters* x *H. pardinum*.
- Etiole* (Souchet, 18....) N.; *H. vittatum* hybrid; Yellowish white, red stripes.
- Eurasian* (.....,) C.; A. M.; Veitch, April 15, 1913.
- Excellent* (.....,) C.; A. M.; Veitch, March 14, 1893.
- Fair Lady* (.....,) C.; A. M.; Veitch, April 7, 1903.
- Favorite* (Veitch, 18....) N.; VH.; *H. reticulatum striatifolium* x *H. leopoldi*; fall blooming.
- Fidelio* (Van Seden, 18....) N.
- Field Marshall* (.....,) C.; A. M.; Holford, April 3, 1906.
- Finette* (Ker, 18....) N.; white with a few light red stripes, *Leopoldi* type.
- Firebrand*, (.....,) C.; A. M.; Paul, April 12, 1892.
- Flora* (Ker, 18...) N.; white, very pale red border and veins; *Leopoldi* type.
- Formosa* (....., 18....) B.; *H. reticulatum* hybrid.
- Francisca* (....., 18....) N.
- Fucinus* (....., 18...) N.; cream yellow, dotted with red.
- fulgens*, (.....,) C.; F. C. C.; Backhouse, April 4, 1865.
- Gem* (.....,) C.; A. M.; Veitch, April 24, 1894.
- General Buller* (.....,) C.; A. M.; Veitch, April 23, 1902.
- Gereant* (.....,) C.; A. M.; Holford, April 19, 1910.
- G. Firth*, (Williams, 18....) N.; *Defiance* x *H. reticulatum*; fall blooming.
- Gloriosa* (....., 18...) B.; *H. reticulatum* hybrid.
- Gorgeous* (....., 18...) N.; C.; very large flowers; clear carmine red; A. M.; Veitch; Mar. 26, 1895.
- Goweni* (Herbert, 18....) H.; B.; *H. reticulatum* x *H. rutilum*; raised at Highclere; very beautiful. Named for R. J. Gowen.
- Gracchus* (.....,) C.; A. M.; Veitch, April 20, 1909.
- Grahami* (Herbert, 18....) H.; *Johnsoni* x *H. vittatum*; approximating the latter, but with larger and more brilliant flowers and tender constitution; named for the botanist at Edinburgh.
- Grand Monarch* (.....,) C.; A. M.; Veitch, April 9, 1890.
- Graveanum* (de Graff, 18....) N.
- Gravinae* (Melazzo, 18....) B.; N.; Syn. *H. gravinae*, Melazzo; *H. reginae* hybrid; glowing red, banded with white.
- Griffini* (Griffin, 18....) H.; *H. psittacinum* x *Johnsonii*; very beautiful and variable in its color; but always distinguishable from *H. psittacinum* by the upper segment not being depressed.
- Harrison* (Harrison, 18...) H.; B.; N.; Syn. *H. harrisonii*. *H. reticulatum* x *H. stylosum*.
- Haylocki* (Sweet, 18...) H.; B.; *H. solan-diflorum* x *H. rutilum*; raised at Spofford; named for the gardener of William Herbert.
- Hendersonii* (....., 18....) N.; *H. leopoldi* hybrid.
- Hendersonii Coccinea* (....., 18...) N.; *H. leopoldi* hybrid.
- Henslowi* (Herbert, 18...) H.; *H. reginae* x *H. rutilum*; raised at Spofford; very brilliant, named for the botanist at Cambridge.
- Herberti* (Sweet, 18...) H.; B.; *H. solan-diflorum* x *H. stylosum*; raised at Spofford; named for William Herbert; pale orange in color.
- Her Majesty* (Williams, 18...) N.; *Defiance* x *H. reticulatum*; fall blooming.
- Hermita* (Veitch, 18...) N. (*illus.*); lilac red with green throat; *Leopoldi* type.
- Hidalgo* (....., 18...) N.; imposing flower; orange red shaded carmine.
- Hidenley* (Strickland, 18....) N.; *Acramanii Pulcherrimum* x *H. reticulatum*; fall blooming.
- Holloway Belle* (Williams, 18....) N.; C.; *Leopoldi* type; A. M.; Apr. 10, 1894.
- Hon. Maurice Gifford* (.....,) C.; A. M.; Apr. 21, 1896.
- Hoodii* (Sweet, 18....) H.; *H. equestre* x *H. reginae*.
- Hookeri* (Herbert, 18...) H.; *Goweni* x *H. vittatum*; named for the botanist at Glasgow.
- Iceberg* (.....,) C.; A. M.; Fri. G. Holford, Apr. 21, 1925.
- Ideala* (Veitch, 1897) N.; C.; A. M.; March 22, 1898; cream white with orange-scarlet dots, especially toward the center.
- Ignacite* (....., 18...) N.; C.; A. M.; Veitch, April 13, 1897; milk white; very light green in throat; feathered red.

- ignescens*; F. C. C.; Veitch, May 30, 1865.
- Imperatrice du Bresit* (.....,) C.; A. M.; Sir Trevor Lawrence, Jan. 14, 1902.
- Iris* (Ker, 18....) N.; white, pale red veins; *Leopoldi* type.
- Jasper*, (.....,) C.; A. M.; Ker, May 29, 1906.
- John Heal* (Veitch, 18....) N.; V.H.; *H. Leopoldi* hybrid.
- John Ruskin* (....., 18.....) N.; giant flower; orange scarlet with white bands.
- Johnsoni* (Johnson, 1810) H.; N (*illus.*); B.; Syn. *H. johnsoni*; *Amaryllis brasiliensis*; *H. vittatum* x *H. reginae*.
- J. R. Pitcher* (.....,) C.; A. M.; Williams, March 10, 1891.
- Julius* (.....,) C.; A. M.; Veitch, May 19, 1903.
- Kinton* (....., 18....) N.; Light red with white star.
- Kobinoor* (Gronen, 18....) N.; *Brilliant* x *H. psittacinum*; deep lilac red ground, tips of petals and center yellowish-white; flowers small but of *Leopoldi* type.
- Lady Ardilaun* (Williams, 18....) N.; *Leopoldi* type.
- Lady Howick* (.....,) C.; A. M.; Sir Geo. Holford, April 2, 1907.
- Lady Juliet Duff* (.....,) C.; A. M.; Lady Duff, Apr. 23, 1929.
- Lady Margaret* (Veitch, 18....) N.; *H. reticulatum* x *H. leopoldi*; fall blooming.
- Lady Winifred Gore* (.....,) C.; A. M.; Smith, Mch. 10, 1896.
- Lamberti* (Herbert, 18....) H.; *Cartoni* x *Grahami*; raised at Spofford and named for A. B. Lambert.
- Leoni* (....., 18....) N.; pure white tips of petals orange red.
- leopoldii*; F. C. C.; Veitch, Dec. 21, 1869.
- Lightning* (.....,) C.; A. M.; Paul, Mch. 28, 1893.
- Lindleyi* (Herbert, 18....) H.; *Griffin* x *Carnarvoni*; raised at Spofford; named for the botanist at London University.
- Lindseyi* (Herbert, 18....) H.; *H. aulicum* x *H. reticulatum*; named for the gardener at Highclere.
- Lois* (.....,) C.; A. M.; Sir Geo. Holford, May 22, 1901.
- Lord Bovingdon* (.....,) C.; A. M.; Holford, Mch. 26, 1901.
- Lord Brassey* (Williams, 18....) N.; *Leopoldi* type.
- Lord Roberts* (.....,) C.; A. M.; Williams, May 25, 1895.
- Lyso* (....., 18....) N.; white and red, veined with green.
- Madonna* (Veitch, 18....) N.
- Magic* (.....,) C.; A. M.; Holford, Apr. 20, 1926.
- Magnificent* (.....,) C.; A. M., Ker Apr. 6, 1909.
- Major Wilson* (....., 18....) N.; *Brilliant* x *H. psittacinus*, dark red ground color, petals tipped cream white. Small flowers of *Leopoldi* type.
- Marathon* (.....,) C.; A. M.; Veitch, Apr. 9, 1901.
- Marcus* (.....,) C.; A. M.; Veitch, Apr. 6, 1909.
- Margaret Pomfret* (Gronen, 18....) N.; *Brilliant* x *H. psittacinum*; dark red ground color, petals tipped cream white; small flowers of *Leopoldi* type.
- Marginata* (....., 18....) B.; *H. solandiflorum* hybrid.
- Marginatum conspicum* (Van Houtte 18....) N.
- Marginatum venustum* (Van Houtte, 18....) N.
- Marion* (Pfister, 18....) N.; *Dr. Masters* x *H. pardinum*.
- Marjory* (.....,) C.; A. M.; Holford, April 3, 1906.
- Mars* (.....,) C.; A. M.; Paul, March 8, 1892.
- Melpomene* (Ker, 18....) N.; Reddish white, strongly veined red; *Leopoldi* type.
- Mendeli* (....., 18....) B.; *H. aulicum* hybrid.
- Mephisto* (....., 18....) N.; lilac red.
- Meteor* (Veitch, 18....) N.
- Milton* (Veitch, 18....) N.
- Minerva* (Ker, 18....) N.; light red ground color; white band and white veins; *Leopoldi* type.
- Mme. Modjeska* (Cronen, 18....) N.; greenish center, dark red ground color with petal tips cream white; flowers small but of *Leopoldi* type.
- Model* (Ker, 18....) N.; cream white with red stripes and veining; *Leopoldi* type.
- Montezuma* (Nehrling, 19....) N.; cross between *H. equestre* and *Empress of India*; flowers 10" wide, short trumpet; fiery orange red with yellow star; flower stalk 3¼ ft. high.
- Mrs. Bilney* (....., 18....) N.; white dotted red; A. M.; Veitch, April 22, 1902.
- Mrs. Carl Jay* (Jay, 18....) N.; (*illus.*); *H. reticulatum* is one parent; fall blossoming; A. M.; Jay, June 11, 1907.

- Mrs. Cleveland* (Pfister, 18....) N.; rose red.
- Mrs. Garfield* (Veitch, 18....) N.; VH.; progeny of *Hippeastrum reticulatum* x *Defiance*; fall blossoming.
- Mrs. Lee* (Veitch,) VH.; see also *Mrs. Wm. Lee*; *H. reticulatum* hybrid; fall blooming.
- Mrs. Montefiore* (....., 18....) N.; C.; large white flowers, "leicht rot gestrichelt"; A. M.; Veitch; Mar. 12, 1895.
- Mrs. Wm. Lee* (Williams, 18....) N.; progeny of *H. reticulatum* x *Defiance*; fall blooming.
- Munroi* (Colville, 18....) H.; *H. psittacinum* x *H. equestre*; named for the gardener of the Horticultural Society, London.
- Murillo* (.....,) C.; A. M.; Sir G. Holford, Mar. 14, 1899.
- Musigny* (.....,) C.; A. M.; Rothschild, Mch. 19, 1912.
- Navala* (.....,) C.; A. M.; Veitch, Mch. 8, 1898.
- Nestor* (Ker, 18....) N.; deep glowing red with white tips; *Leopoldi* type.
- New Pink Pearl* (.....,) C.; A. M.; Holford, Apr. 20, 1926.
- Nimrod* (.....,) C.; A. M.; Veitch, Mch. 14, 1893.
- Norma* (....., 18....) N.; peculiar shade of red and white.
- Novelty* (.....,) C.; A. M.; Paul, Mch. 27, 1894.
- Nysa* (.....,) C.; A. M.; Veitch, Apr. 8, 1902.
- O'Brieni* (O'Brien, 18....) N.; *H. pardinum* x *H. reticulatum*; fall blossoming; constitution too weak and soon disappeared.
- Olympia* (.....,) C.; A. M.; Veitch, Mch. 27, 1894.
- Ophelia* (Williams,) N.; C.; *Leopoldi* type; A. M., Mar. 28, 1893.
- Oriflamme* (Souchet, 18....) N.; *H. vittatum* hybrid.
- Pardinum*; C.; F. C. C.; Veitch, Mch. 19, 1867.
- Parkeri* (Herbert, 18....) H.; *H. rutilum* x *reticulatum*; named for the foreman at Spofford.
- Pearl Maiden* (.....,) C.; A. M.; Sir Geo. Holford, Apr. 3, 1906.
- Pera* (.....,) C.; A. M.; Veitch, Mch. 23, 1897.
- Picta* (....., 18....) N.; also known as *Hippeastrum picta*; progeny of *Hippeastrum solandriflorum* x *Johnsonii*.
- Pink Beauty* (Ker,) N.; light red rose with white star; *Leopoldi* type.
- Pink Blossom* (.....,) C.; A. M.; Holford, Apr. 21, 1925.
- Pinkie* (.....,) C.; A. M.; Sir Geo. Holford, Apr. 20, 1909.
- Pink Pearl* (Ker, 18....) N.; rose red. *Leopoldi* type.
- Pinzoon* (....., 18....) N.; ideal form; deep scarlet red.
- Pirlotti* (Haage & Schmidt, 18....) N.; fall blooming.
- Praeclara* (....., 18....) B.; *H. reticulatum* hybrid.
- President Carnot* (.....,) N.
- Prince Edward* (.....,) C.; A. M.; Veitch, Mch. 12, 1895.
- Prince of Orange* (Van Houtte, 18....) N.
- Princess Osra* (.....,) C.; A. M.; Sir Geo. Holford, Mch. 8, 1898.
- Prof. Koch* (.....,) N.
- Progress* (Ker,) N.; shining red; *Leopoldi* type.
- Pulchrum*; C.; F. C. C.; Veitch, June 4 1873.
- puniceum ignescens*; C.; A. M.; Preston, Apr. 11, 1928.
- Purity* (.....,); F. C. C.; Burns, Apr. 28, 1908.
- Queen of Spots* (Bonavia, 18....) N.; *H. paradinum* hybrid (?)
- Queen Alexandra* (.....,) C.; A. M.; Veitch, Apr. 22, 1902.
- Queen Mary* (.....,) C.; A. M.; Ker, Mch. 14, 1911.
- R. P. Pitcher* (Williams, 18....) N.; *Defiance* x *H. reticulatum*; fall blooming.
- reticulatum*—*Mrs. Garfield* (.....,) C.; A. M.; Clarke, Aug. 28, 1928.
- Rialto* (.....,) C.; A. M.; Veitch, April 9, 1901.
- Robin* (.....,) C.; A. M.; Sir Geo. Holford, Mch. 14, 1899.
- Ronda* (....., 18....) N.; white ground with a little red; A. M.; J. Veitch, Apr. 19, 1904.
- Rosalind*, (.....,) C.; A. M.; Veitch, Mch. 24, 1896.
- Rose du Barry* (.....,) C.; A. M.; Rothschild, Mch. 19, 1912.
- Rosemary* (.....,) C.; A. M.; Rothschild, May 19, 1931.
- Rose Maddar* (.....,) C.; A. M.; Ker, May 29, 1906.
- Rose Perfection* (Ker,) N.; rose red, *Leopoldi* type.
- Royal Standard* (Veitch, 18....) N.; *H. leopoldi* hybrid (?)

- Ruby* (.....) C.; A. M.; Schroder, Jan. 27, 1931.
- Ruby Gem* (Ker, 18...) N.; beautiful ruby red; *Leopoldi* type.
- Ruth* (Pfister, 18...) N.; *Dr. Masters* x *H. pardinum*.
- Salvator Rosa* (.....) C.; A. M.; Paul, Mch. 14, 1893.
- Sappho* (Ker,.....) N.; deep carmine, *Leopoldi* type.
- Scarlet Gem* (Ker, 18...) N.; pure brilliant scarlet red; *Leopoldi* type.
- Sea Nymph* (.....) C.; A. M.; Paul Apr. 23, 1899.
- Seraph* (....., 18...) N.; brilliant lilac red; white star and streaks.
- Serapis* (....., 18...) N.; lilac red; white stripes.
- Seymouri* (Herbert, 18...) H.; *H. alicum* x *H. vittatum*; named for the gardener of William Herbert.
- Sibyl Houdyshel* (Houdyshel, 19...) Hou.; white reticulated and bordered pink.
- Silver Queen* (.....) C.; A. M.; Paul, Mch. 22, 1892.
- Sir Christopher Wren* (.....) C.; A. M.; Sir Geo. Holford, Mch. 25, 1902.
- Sir William* (.....) C.; A. M.; Roy. Bot. Gard. Kew, Feb. 14, 1899.
- Smollet* (....., 18...) N.; scarlet red, deepening in center.
- Snowdon* (Fielder, 18...) N. (*illus.*); finest white up to 1909; *Leopoldi* type; F. C. C.; Apr. 19, 1904.
- Snow King* (Ker, 19...) N. (*illus.*); pure white. *Leopoldi* type.
- Socrates* (.....) C.; A. M.; Veitch, Mch. 14, 1898.
- solandriflorum*, C.; A. M.; Pam, Oct. 7, 1924.
- Southey* (....., 18...) N.
- Speciosa* (Ker, 18...) N.; the edges and tips white, with middle deep red; *Leopoldi* type.
- Spectabile* (....., 18...) B.; N.; *H. reginae* hybrid.
- Spectabilis* (Ker, 18...) N.; beautiful red, tips of petals white; *Leopoldi* type.
- Speculum* C.; A. M.; Veitch, Apr. 10, 1894.
- Splendidum* (Herbert, 1824) VH.; *H. vittatum* x *H. reginae* or *H. equestre*.
- Spofforthiae* (Herbert, 18...) H.; *H. alicum* x *Carnarvoni*, named for the estate Spofford.
- Spotted Angelina* (Bonavia, 1909) N.; *H. pardinum* hybrid.
- Spotted Orfeo* (Bonavia, 18...) N.; *H. pardinum* x ?
- Star of India* (....., 18...) N.; dark red with broad white bands.
- Sweetii* (Sweet, 18...) H.; B.; *H. reticulatum* x *Johsoni*.
- Sylvannus* (.....) C.; A. M.; Veitch, Apr. 8, 1902.
- Sylvia* (Veitch, 18...) N.; C.; *H. reticulatum* x *H. leopoldi*; fall blooming; A. M.; Apr. 19, 1892.
- Syren* (....., 18...) N.; C.; clear rose; large flower; A. M.; Veitch, Mar. 28, 1893.
- Tacola* (.....) C.; A. M.; Veitch, Mch. 22, 1898.
- Telemus* (....., 18...) N.; white ground, veined lilac red.
- Tettaui*; N.; cultivated form of *H. alicum robustum*.
- The Bride* (.....) C.; A. M.; Holford, Apr. 20, 1926.
- The Champion* (.....) C.; F. C. C.; Veitch, Mch. 11, 1890.
- The Czar* (.....) C.; A. M.; Holford, Apr. 13, 1897.
- The Hon. W. F. D. Smith* (.....) C.; A. M.; Hambledon, Feb. 14, 1893.
- The Vigil* (....., 18...) N.; white striped with red.
- Thunberg* (.....) C.; A. M.; Veitch, Apr. 13, 1897.
- Titan* (.....) C.; A. M. Veitch, Apr. 10, 1900
- Topaz* (....., 18...) N.; C.; orange red; border and striped with white; A. M.; Veitch, Apr. 13, 1897.
- Vandyke* (.....) C.; A. M.; Veitch, Mch. 24, 1891.
- Viscountess Hambledon* (.....) C.; A. M.; Smith, Apr. 21, 1896.
- Vittatum Harrisonianum* (.....) C.; F. C. C.; Bull, Feb. 14, 1894.
- Vulcan* (.....) C.; A. M.; Sir G. Holford, Apr. 2, 1907.
- Zephyr* (.....) C.; A. M.; Veitch, Apr. 10, 1900.

4. Amarylleae Breeding

HYBRIDIZATION IN AMARYLLEAE*

A. WORSLEY, *Middlesex, England*

I purpose in this article to deal with hybrids that have been raised in gardens between individuals of this sub-order, from warm, temperate, tropical, and equatorial regions, differing from each other specifically (or in a higher degree), and especially with the few that have come under my own observation in a living state.

I have purposely excluded the *Narcissi*, and two other genera hardy in Great Britain (*Galanthus* and *Sternbergia*), partly because I have not made a special study of them, and partly because the subject of hybridization within such limits has already been dealt with by expert writers.

One generalization, however, is not out of place here. The habitat of the *Narcissi* is over a comparatively restricted area, and the fact that so many alleged hybrids have originated in a natural state without human interposition, coupled with the ease with which hybridization is effected in gardens, indicates that the whole genus has within comparatively recent times sprung from one prototype. Even between the extreme types of this genus exist regular gradations of individuals, each differing in some respect from each other—there is hardly one link missing in the chain.

This, again, points to a period of time, by no means lengthy, antecedent to which the genus was represented by only one, or at most very few, types or species; for this period has not been long enough for any number of the intermediate types to die out. Hence it follows that if the bulk of species of *Narcissus* are of recent establishment, the relationship existing between them is closer, and their individual characters not so irrevocably fixed as in the case in other genera in which no break has occurred for an enormous period of time.

The hybridization of *Narcissi* is, therefore, an occupation in which the chances of success are so great as to amount to a practical certainty. But when attempts are made to hybridize, say, the *Crinums* of Asia or Africa with those of America, the chances are equally great against a successful issue. Yet the prize is great, too, for success establishes a fresh epoch in that branch of horticulture, and opens fresh possibilities and fresh avenues of enterprise for all to profit by.

Among the genera specially dealt with in this article, forty-seven in number, only one, *Hippeastrum*, has become generally recognised among florists as worthy of special treatment.

It is a matter of general belief that the first hybrid raised was *H. johnsoni*, about 1799, and from this and other subsequent crosses the present race of mongrels has been evolved.

Yet this fact has for many years stood out in my mind as of paramount importance, that if a botanist were to find growing wild all the *Hippeastrums* cultivated to-day at our most notable professional establishments, he could not, at the outside, make more than two species out of them. Out of these, *H. vittatum*, remains just as it was nearly one hundred years ago in all its principal specific characters; it is certainly bigger, wider in the segments, more expanded in the flower—it has, in short, been “*improved*,” but it has not been altered. I can see no evidence of hybridization, no evidence of anything further than selection and good cultivation would naturally produce.

I have only once seen a form of *H. vittatum* which in my estimation showed a probable hybrid origin. This came to me from the West Indies under the name of “*Defiance*,” but no information as to origin or parentage were forth-coming. It is a small-flowered, brilliantly-coloured form, resembling that figured in *Bury, Selection of Hexandrian Plants* (1831), tab. 31, as “*superba*,” but remarkable for having the typical vittate marks obscured towards the base of the upper segments by red suf-

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fusion. The style is also ascending to an unusual degree, and carries the stigma as high as the tip of the upper segment at maturation. I have raised hundreds of seedlings from dozen of alleged hybrids bearing the typical vittate markings, and these have all come as true from seed as any good species would do.

In these experiments I have obtained the alleged hybrids from a variety of sources, both British and continental. I have also attempted, times without number, to implant the vittate markings upon self-coloured forms, such as *H. equestre*, and vice versa; but without any results so far, although I have now some promising supposed hybrids with *H. aulicum*.

The other species which the botanist could form has no exact counterpart in nature. It has a short, wide-segmental, well expanded, large, substantial flower with the hairy throat of *H. equestre major*, the colour most commonly of *H. equestre* and *H. rutilum* (rarely of *H. aulicum*) and the keel markings of *H. reginae*. The colours are now very varied and the rarer colours, especially the coppery-reds and those nearest white, have of late been diligently sought and selected, and hence have increased in collections at the expense of the eliminated colour varieties.

Recently some pure self reds have appeared in collections, and these at first caused some speculation, although it is admitted that in all parti-coloured or "marked" flowers there is a tendency for selfs to appear at times spontaneously among the seedlings. (I had an example last summer, where out of some thousand "Cloth of Gold" Marigolds, three plants reverted to pure yellows.)

I have always held to the theory that if we could only look back far enough into the past we should see that the first parents of all our parti-coloured or marked flowers were selfs, and inconspicuous-coloured at that. Hence the appearance of selfs among our collections of seedling *Hippeastrums* did not surprise me in the least, although I was unaware of any coloured selfs among good species.

In the summer of 1895, however, I received from Brazil a box of bulbs which proved to be those of *H. stylosum*, and among these were a few bulbs of a self-red species hitherto undescribed, for which Mr. Baker, on examination of the flowers, suggested the very appropriate name of *H. tricholepis*, described and figured in M.S.S., Feb., 1896. This was an interesting incident, not as tending to disprove the assertion of alleged hybridizers—that they had introduced something new to the genus in their self-coloured reds, but as putting forward a tenable proposition that the result of their efforts had caused a colour reversion to some ancestral type, such as might have occurred in any seedling.

On the same hypothesis, it is easy to account for the occasional appearance of a few whitish, or greenish-white, seedlings.

Having described these two species, a botanist could do no more. Out of the twenty species which, according to Mr. Baker, belong to the subgenera (*Macropodastrum*, *Omphalissa*, *Aschamia*, and *Lais*), and which may be said to constitute the true *Hippeastrums*, seventeen have been at some time common in cultivation. Of these seventeen common species, the alleged hybridizers have succeeded in perpetuating one (*H. vittatum*), and four others in one composite form. No traces of the remaining twelve exist. Where can we find the habit of colour of *H. porcerum*, the habit of *H. solandriiflorum*, or *H. cybister* (so remarkably distinct), the spreading stamens of *H. calytratum*, the spots of *H. pardinum*, the double flowers of *H. alberti*, or the marvellous markings of *H. leopoldi* or *H. reticulatum*?

Some say that the pre-potency of certain species has extinguished the weaker blood of the rest (?). If so, that is an effect which intelligent persons would be expected to fight against. It is a certain fact that the species of which all traces have disappeared are not long-lived as individuals, nor good seed-bearers under cultivation.

If on top of this the efforts of our hybridizers to impregnate other species with their pollen were ineffectual, their ultimate disappearance is easily accounted for, without having to call in any speculative ideas. My belief is that there has not been so much genuine hybridization among the *Hippeastrums* as we have been led by some to think; yet the fact remains that something has been done, and that the blood of some four species runs in our present mongrel race.

Messrs. Veitch have done great work among the garden forms, and have produced a race of large-flowered mongrels. They were the introducers of *H. pardinum* and of *H. leopoldi*, and many people lay great stress on the improvement caused by these introductions. But to my mind it is very doubtful to what extent, if at

all, their blood runs into the existing garden mongrels. No doubt many attempts were made, and seedlings raised, but Mr. Harry Veitch himself records in his contribution to the issue of the *Journal of the R. H. S.*, July, 1890, that "many of them," the supposed hybrids, "came so near the species as to be practically the same thing, or the same but slightly varied, yet we are able to select several distinct new forms showing a marked improvement on their progenitors in breadth and substance of segment, size and symmetry of flower, &c." This certainly shows careful selection, but disproves hybridization.

When we try to discover when and by whom hybridization has been effected, we are met by grave difficulties. Mrs. Bury's work, published in 1831, just when the early hybridizers were in full swing, figures four supposed hybrids, and these figures may reasonably be held to give us either the whole of the ascertained hybrids that had up to then been flowered, or at least the most remarkable of them. For it cannot be supposed that a work got up at such expense and with such care would have figured the least noteworthy forms. Yet among the four figured there is not one solitary case in which specific hybridization had undoubtedly taken place. At best we have to deal with guesses and suppositions, which subsequent writers have treated as though they were dealing with ascertained facts.

In dealing with these earliest hybrids figured by Mrs. Bury, attention should be drawn to the fact that the *Liverpool Botanic Gardens*, where many of the plants were drawn, gave, at that period, unrivalled facilities for studying the subject with which I am dealing.

A Mr. Harrison, a native of Liverpool, but living in Brazil, was then sending home many species of *Hippeastrum*, mostly of great beauty, and all of them new to cultivation, to his friends and relatives in Liverpool.

As, in those days, few private individuals possessed efficiently-heated structures to grow such plants in, the botanic gardens became the recipients of most, if not all, of these importations. Hence, it was here, under the care of Messrs. Shepherd, that a great opportunity occurred for the hybridization of these plants. To begin with *Johnsoni*, we are at once plunged into a sea of doubt and speculation. Mr. Baker says that Johnson was a watchmaker of Prescott, in Lancashire, when he effected the first hybridization in 1799; but Mrs. Loudon, in 1841, writes that he was "a person named Johnson who had a small garden at Mitcham in 1810;" no other information was apparently forthcoming about him at that date. Mrs. Bury's figure was certainly drawn prior to 1830, yet she evidently felt that she was treading on dubious ground, for she says—

"The prototype is said to have been first raised about the year 1799, from the seed of *vittata* impregnated with *formosissima*, by Mr. Johnson . . . and the present specimen is from one of the original bulbs, presented by Mr. Johnson to the late E. Falkner, Esq., of Fairfield, near Liverpool."

At least she felt certain that this plant that she was drawing was indubitably the *Johnsoni* of Johnson himself. It bears a seven or eight-flowered scape, and is of a dark self crimson, banded to the apices of the segments, with a narrow, sharply defined, deep red keel, turning suddenly to whitish-green in the lower third.

The plant called *Johnsoni* nowadays is an entirely different thing; it has three or four flowers, is of a light brick-red colour, with a lighter-coloured (or white) keel in the lower two thirds, as described in Nicholson's *Dictionary of Gardening*. He only claims that it was one of the earliest hybrids. Only once have I seen the *Johnsoni* of Johnson alive, and that was about a dozen years ago, in the collection of the late Mr. James Backhouse, of York. I believe that the plant is now extinct. As to its parentage, *formosissima*, as we know the name, and as it is figured in Bury's work, belongs to the genus *Sprekelia*, which will not fertilise the stigma of any true *Hippeastrum* (so far as very extensive experiments teach me; Dr. Bonavia has reached the same conclusion as the result of his experiments). Secondly, there is no resemblance whatever to *Sprekelia* in the alleged offspring. The alleged female parent, *H. vittatum*, is one that I have never succeeded in hybridizing, nor does *Johnsoni* bear any resemblance whatever to *H. vittatum*.

Hence, I think we may dismiss the supposed parentage of *Johnsoni* as pure guess-work—and bad at that. It might pass as a hybrid between *H. equestre*, and some form of the *rutilum-reginae* group, or it might be simply a seedling of some variety of the latter group.

Mrs. Bury notes a "fringed nectary in the throat," and this is especially remarkable in *H. equestre major*, and in a less degree of some *rutilum-reginae* forms, such as *H. subbarbatum* (*Bot. Mag.*, 2475). The facts, as they are presented by Mrs. Bury, would not lead me to class *Johnsoni* as a true hybrid, much less as one of ascertained parentage.

Mrs. Bury notes that "many learned disputes" had arisen on the subject, and that "many seedlings from *reginae* and others have obtained the appellation of *Johnsonian*." We are referred to the writings of *Herbert*, *Gowen*, and *Lindley*, for further information. Mr. Baker states that *Johnsoni* was raised out of *H. reginae* by *H. vittatum*.

To proceed with Mrs. Bury's hybrids. The beautiful and distinct white form called "*picta*," I have never seen alive. Had a hybrid origin been claimed for it, no one could have controverted the statement. But no claim to hybridization is put forward by Mrs. Bury. In figure 7, however, a very lovely unnamed seedling is figured (white, edged pink), raised out of *H. solandriflorum* by *Johnsoni*. It is a pity that such a charming and distinct form should so soon die out of cultivation, for there does not appear to be any subsequent record of this seedling or hybrid. Not improbably it was a mule, in which case it would die out in about five or six years, the average length of family-life of *H. solandriflorum* under cultivation in England.

The reverse cross is also given in fig. 46, showing a fine crimson flower with white star, and long tapering apices to the segments. I have seen nothing like this alive. If *Johnsoni* was not a hybrid, then these two beautiful seedlings were specific hybrids, and not improbably mules. Mr. Baker, in his invaluable *Handbook of the Amaryllideae*, pp. 47, 52, 53, gives a mass of information about the earlier and subsequent hybrids and mongrels.

H. griffini, of the *Botanical Magazine*, 3528, is cited as a hybrid between *H. psittacinum* and *Johnsoni*. Certainly the figure is not typical of *H. psittacinum*, and the plant is not improbably a hybrid. Yet it cannot be said that its parentage is undoubted, because it appears (in the letter-press) that it was raised by "W. Griffin in his hothouse at S. Lambeth previous to 1820," and did not flower till after sixteen years or more had elapsed. Seedlings usually flower in from eighteen months to four years from date of sowing, and in sixteen years or more there was certainly time for many things to happen.

Any attempt to follow out the 100 alleged hybrids named in Sweet's *British Flower Garden* in 1830, or those dealt with by the other authors referred to by Mr. Baker, cannot be made within the limits of this article. But with regard to those for which hybrid origin is claimed, mentioned in Mr. Baker's work, I would remark that I have received direct from different parts of South America plants indistinguishable from those figured in *Redoute*, 469 (*Brasiliensis*), and by Loddiges in *Botanical Cabinet*, 159 (*spectabile*) for which Loddiges raised no claim to hybrid origin. Mr. Baker has also included among alleged hybrids, plants such as *ambiguum* of *Botanical Magazine*, 3542, and *Harrisoni* of *Bury*, 27, of which latter Mrs. Bury distinctly states that it was imported from Peru and flowered for the first time in 1824. (*Vide* also Nicholson in *Dictionary of Gardening*.)

It may perhaps be claimed fifty years hence that the alleged new species, *H. arechaveletae*, is a hybrid, because it resembles some such alleged hybrid of the early years of last century. Some of the hybrids, or mongrel-bred plants, mentioned by him I have, or have had, alive in my collection—such as *Carnarvonia*.

Mr. James O'Brien figured in the *Garden* of July 12, 1879, the fine hybrid *O'Brieni*, raised out of *H. pardinum* by *H. reticulatum*, but this also seems to have proved a mule, and died out in due course.

M. Van Houtte also figured in his *Fl. des Serres*, 1277, an alleged hybrid between *H. reticulatum* and *H. vittatum*, but I have no information as to whether the parentage of this plant was ascertained beyond doubt. There seems nothing improbable in the parentage from the figure.

Sir Charles Strickland, Bart., informs me of a hybrid between *H. aulicum* and *H. calyptratum* which he has in cultivation. This extremely interesting plant should certainly be figured and put on record. I have visited the districts where both species grow in close proximity, although I never found them intermingled. Both species are prolific in varieties, but I found no trace of any intermediate forms, such as might be reasonably supposed to be natural hybrids, between them.

The following give some notable plants belonging to this genus, for which a hybrid origin has been claimed:—*Ackermani pulcherrima* (*H. aulicum* x *Johnsoni*),

Garaway, Bristol, 1850; *Splendidum* (*H. vittatum* x *H. reginae*, or *H. equestre*), Herbert (Bot. Reg. App., 1924); *Johnsoni II* (*H. vittatum* x *H. reginae*), Gowen, Hichclere; *Acramanii* (*H. aulicum* x *H. psittacinum*), Garaway, Bristol, 1835.

I have put *II* after *Johnsoni*, to distinguish it from the *Johnsoni* of Johnson.

My own efforts have been directed for many years to raise *Hippeastrum* hybrids, but I cannot claim to have met with success in any single instance. From this experience it would appear that raising inter-specific hybrids in this genus is a much more difficult matter than is generally supposed.

The labours of many hybridists during the past century have only produced, so far as I am aware, the three or four undoubted hybrids mentioned previously, viz: (1), *H. solandriflorum* x *Johnsoni*; (2), *Johnsoni* x *H. solandriflorum*; (3), *H. pardinum* x *H. reticulatum*, and possibly *H. reticulatum* x *H. vittatum*. These must be reduced to two or three if *Johnsoni* is regarded as a hybrid. Probably, almost certainly, others have been raised, and their parentage left in doubt. I think this has been more especially the case with such species as *H. equestre*, *H. aulicum*, and the *rutilum-reginae* group. I have found all these species to be good seed-bearers on their own pollen, or when crossed with mongrel forms. The fact that such mongrels have already in them the blood of these species, accounts to my mind for the ease with which they cross back with their pure bred relations. Dr. Bonavia also informs me that when in Lucknow he raised many crosses of *H. equestre* (presumably with garden mongrels?), which produced interesting and beautiful varieties. My own experience coincides with this. The epiphytal section, from the Organ Mountains, also set seed freely with me on their own pollen; and I have raised seedlings from *H. solandriflorum*, *H. stylosum*, and *H. vittatum*. In fact in every case where fair and prolonged trials were carried out with healthy bulbs, fertile seeds were produced. I experimented with twenty-five species and varieties of *Hippeastrum*, not including hybrids.

Among allied genera such as *Habranthus*, *Zephyranthes*, and *Sprekelia*, I can find no specific hybrids. Some *Zephyranthes* seed very freely with me, especially *Z. brachyandra* (*Habranthus brachyandrus* of some), *Z. gracilifolia*, *Z. rosea*, *Z. elliptica* (*sp. nova*), and *Z. andersoni*. *Z. brachyandra* is a most extraordinary plant as regards seed production. I have taken the greatest precautions to prevent self-fertilization, often cutting into the flower the day before expansion to remove the inert anthers; and have attempted to cross it with every form of *Hippeastrum* and *Zephyranthes*. On practically every occasion seed has formed, and with unvarying regularity the seedlings have proved true to type. This mystery is one I have been unable to solve.

To test the "prepotency" theory, I tried the pollen of *Sprekelia*, *Placea*, and *Lycoris*, with just the same result, or lack of result. *Z. candida major* never bears seed with me, though typical *Z. candida* does so freely in most places; *Z. carinata* also never carries seed, nor does *Sprekelia*. I experimented with thirteen species in these genera.

Among *Hymenocallids*, some three very interesting hybrids have been raised:—

H. macrostephana was raised in Herbert's time, by crossing *H. speciosa* and *H. calathina*. Recently Mr. Hoog (of the firm of C. G. Van Tubergen, Junr., Haarlem), repeated the cross, taking fine forms of both species as parents. He has named his hybrid *Daphne*, and it is certainly both superior to, and distinct from, the *H. macrostephana* previously in commerce. It differs from Mr. Baker's description, in having foot-stalks 7 inches long to the leaves, and the flowers are larger and "toothed" differently. It appears to be a mule.

H. amancaes crossed with *H. calathina* by Herbert gave the sulphur-coloured hybrid of *Botanical Register*, 1665 equiposed between either parent. This hybrid (*Sulphurea*) is still living, and I received it a few years back from Sir Charles Strickland.

Colonel Trevor Clarke, by crossing *H. calathina* with *Elisena longipetala*, raised a hybrid which Mr. Baker could not differentiate from the Peruvian *Ismene deflexa*.

I cultivate twelve kinds of *Hymenocallis* and *Elisena*, and find them all to carry seeds at times, excepting the two hybrid mules, and a new sp. (*schizostephana*).

Among *Eucharis* and *Urceolina*, two hybrids are recorded. Far the most interesting is the generic hybrid (*Urceocharis*, Mast.) between *Eucharis* (species?) and *Urceolina aurea* raised by Messrs. Cliban. This, roughly, takes after *Eucharis* in colour, and *Urceolina* in form. *Stevensii* is a hybrid between *E. candida* and *E. sanderi*, of recent origin, I think.

Burfordienseis, raised in the garden of Sir Trevor Lawrence, but of unascertained parentage, has recently been claimed as a hybrid. Similar claims have been advanced to another form under the name of *Elmetiana*.

Mr. Krelage, in his short monograph of the genus *Eucharis*, listed both *Mastersii* and *Bakeriana* as hybrids, the former between *E. grandiflora* and *E. sanderi*; the latter between *E. grandiflora* and *E. candida*. I cultivate only five kinds of these genera, and the only one which bears seed with me is *E. lehmanni*, which does so regularly.

In the large cosmopolitan genus *Crinum* is wide field for hybridization. I know of three undoubted hybrids. Kunth, in his *Enumeration*, vol. v., p. 582, gives twenty-three alleged hybrids, and Sweet, B. F. G., p. 512, gives thirty-two.

Herbert claimed *Govenianum* as a hybrid, and had it figured, but the plant apparently died out shortly after.

Bury (fig. 30) gives an unnamed hybrid raised out of *C. pedunculatum* by *C. zeylanicum*. Curiously enough, the result, as appearing in the painting, shows a plant indistinguishable from *C. amabile*. However, there is no reason for hesitating to accept Bury's statement as to its hybrid origin.

C. Powellii was apparently raised some time not long prior to 1887, in Sir W. Bowman's garden, by crossing *C. moorei* and *C. longifolium*. The result is a beautiful and very useful plant equi-poised between the parents, but possessing originally a brilliant rosy-pink colour more intense than either. Since then *Powellii* has become widely spread in British gardens, and a very beautiful pure-white form has appeared, besides others bearing many shades of pink. The hybrid has all the hardiness of *C. longifolium*, and, I am informed, seeds freely, which is very rare in hybrids. I have, however, some doubt as to whether *C. moorei* is a good species. Seedlings raised by me, from plants flowering in the open ground, in a garden where no other open-air forms were grown, showed a wide divergence from the type, both in colour and shape of flower. The same splendid rosy-pink that *Powellii* has appeared in one seedling, combined with a flower widely divergent in shape from the parent. In fact, had I attempted to hybridize the parent, and had I succeeded in raising such a plant as this. I should have been quite satisfied that I had raised a true hybrid. This is, I believe, the way in which many alleged hybrids have been raised by really conscientious gardeners.

Only two of my seedling *C. moorei* have yet flowered, and neither of them was true to type.

Of course, if *C. moorei* comes "any way" from seed, we may entertain doubts as to whether the blood of *longifolium* enters into the composition of *Powellii*, which might be merely a seedling of *C. moorei*.

In any case, if *C. moorei* does not come true from seed, it is not a "species," and hence *Powellii* would not be a specific hybrid, nor the plant below (*C. scabrum* x *C. moorei*). Among the twenty-five kinds of *Crinum* cultivated in my garden I find *C. moorei* the most certain seed-bearer. *C. giganteum*, *C. odorum* (*sp. nova*), and *C. purpurascens* have never borne fertile seed.

Recently I raised a new hybrid *Crinum* out of *C. scabrum* by *C. moorei schmidtii*. The female parent was the Jamaican variety, which is by far the finest form of *C. scabrum*. The seedlings flowered in three years and ten months, and the foliage partook of the characters of both parents. The flowers were most like *C. moorei* in shape, but of a brilliant crimson-pink colour, more intense than in any *Crinum* I have seen before. Another seedling from the same fruit was not so intense in colour. Both have refused to carry seed so far.

Another plant of tantalizing parentage is *Amaryllis kewensis*. When I first saw this plant at Kew, some dozen years or so back, it was labelled "*Amaryllis hybrid, Arbuckle's var.*" Later on it got down to *Amaryllis belladonna*, Arbuckle.

At one time, as far as I could gather from various sources, it had come to the Royal Gardens as an unflowered supposed hybrid between *Brunsvigia josephinae* and *Amaryllis belladonna*. Its supposed parentage did not carry it through the critical examination to which it was subject on flowering. But still, there it was—a live thing that was *not Amaryllis belladonna*, and yet could claim no ascertained parentage.

And so it got called *A. kewensis*. And certainly, as a commemorative name, its splendid inflorescence, unmatched among the *Amaryllids* for fragrance and beauty, entitled it to be associated with the Royal Gardens.

Yet I am of opinion that had this plant been claimed as an ascertained hybrid of *Brunsvigia* and *Amaryllis* by some authority, such claims could not have been overlooked: for it shares in many respects the characters of both suggested parents. Among the five kinds of *Brunsvigia* and *Amaryllis* in my garden, all bear seeds freely.

In the *Gardeners Chronicle* of Nov. 10, 1900, mention is made of an alleged hybrid between *Vallota* and *Amaryllis*, raised by Mr. Rix of Truro, having cerise flowers. He states that he has never known *Vallota* to produce seed unless artificially impregnated. This is not my experience, although it is certainly a bad seed bearer in some districts. At Terrington, in N. Yorkshire, where I cultivated *Vallota*, it seeded freely every autumn without any artificial impregnation.

Mr. Rix himself says that, "The only noticeable difference is the thicker necks of the bulbs, and the variation in colour"—that is from the female parent. It would appear that in Mr. Rix's seedlings, 89 per cent. came true, 2 per cent. were anaemic, and 9 per cent. showed colour variety. This is not much beyond the allowed 5 per cent. of variation in true species. I would also remark that cerise coloured *Vallotas* were recorded many years ago, and constitute a well ascertained, but inconstant, colour variety. I have an old plate marked "225, J. Andrews" (believed to be from the *Foral Magazine*) of this variety.

Among *Vallota* and *Crytanthus* I have only heard of one hybrid, raised by crossing *Cyrtanthus* (*Gastronema*) *sanguineus* and *Vallota*. This interesting plant is nearly equi-posed between its parents but has not the showy points of either. It is named *C. hybridus*, and was raised apparently in 1885, and first described by Mr. N. E. Brown, but I have never seen any statement as to who raised it, or which was the female parent.

I have on several occasions repeated the cross both ways, but without raising seed except on one occasion; in fact, I can never get *C. sanguineus* to carry seed of any sort, and of recent years, from some cause (probably smoke), *Vallota* has refused to thrive in the London neighbourhood.

Among *Nerines* some twelve hybrids have been raised dating from Herbert's time. He himself raised seven: *N. curvifolia* x *N. undulata* gave *Mitchamia* and *Vericolor*; *N. curvifolia* x *N. flexuosa* gave *Haylocki*; *N. sarniensis* x *N. undulata* gave *Spofforthiae*; *N. flexuosa* x *N. undulata*, and x *N. humilis*; *N. humilis* x *N. undulata*, and *N. curvifolia* x *N. sarniensis*, all gave unnamed hybrids.

Mr. Baker also tells us (*Handbook of Amaryllideae*, p. 103) that within recent years the following hybrids have been raised by Messrs. O'Brien, Leichtlin, Cam, and others:—*N. pudica* x *N. humilis* gave *Amabilis*; *N. flexuosa* x *N. sarniensis* gave *Elegans*; *N. sarniensis* x *N. curvifolia* gave *Meadowbanki*; *N. flexuosa* x *N. curvifolia* gave *Manselli* (said to be hardy); *N. undulata* x *N. flexuosa* gave *Roseo-Crispa*. I have the two latter.

Some of these show a great advance on the parents, but a really critical examination by an expert would, I feel sure, reduce this list. I think that the facility with which the species of *Nerine* hybridize is due to the same causes which have admitted of a similar state of things among the *Narcissi*.

Personally I do not claim much knowledge of this genus, and should be interested in learning whether all the alleged species of *Nerine* come true from seed?

Between *Clivia* and *Imantophyllum* one hybrid has been raised. *I. cyrtanthiflorum* (*Flore des Serres*, t. 1887), *I. miniata* x *C. nobilis*.

In *Haemanthus* I can only find one admitted hybrid, *Clarkei*, raised by Colonel Trevor Clarke by crossing *H. coccineus* and *H. albiflos*, but I have heard of several recently raised but not yet distributed, such as *H. King Albert* (*H. katherinae* x *H. puniceus*). Among the six species I cultivate *H. katherinae*, *H. Kalbreyri*, and *H. puniceus* bear seed freely.

Among the genera which have produced no hybrids whatever, I find the following carry seeds freely besides those I have incidentally mentioned above):—*Pancratium*, *P. canariense*, *P. illyricum*, and *P. maritimum*; *Lycoris cyrtanthiflora* (*sp. nova*); *Acis autumnalis*. The following plant I have frequently tested, but without ever raising seed: *Lycoris squamigera*. The following hybrids are said to have been recently raised, but have not yet flowered:—*Crinum giganteum* x *C. longifolium* (Elwes); *C. scabrileum* x *C. erubescens* (Elwes); *Vallota* x *Amaryllis* (Kew); *Brunsvigia* x *Amaryllis* (Kew).

Synopsis of Results

Number of admitted (specific or generic) hybrids of ascertained parentage:—

1	<i>Hippeastrum</i>	4
2	<i>Hymenocallis</i>	3
3	<i>Elisena</i>	
4	<i>Eucharis</i>	2
5	<i>Urceolina</i>	
6	<i>Crinum</i>	3
7	<i>Vallota</i>	1
8	<i>Cyrtanthus</i>	
9	<i>Nerine</i>	12
10	<i>Haemanthus</i>	1
11	<i>Clivia</i>	1
<hr/>		<hr/>
Tot. in 11	genera	27 hybrids
36	genera produced no hybrids.	
<hr/>		

47 genera dealt with above.

These results have been reached by a process of elimination. They do not claim to give the total number of hybrids raised in these genera, but only the ascertained hybrids of undoubted parentage.

As for those which have appeared from time to time in gardens by some fortuitous process, by some forgotten labours, or as the purely natural result of grouping together in one house the various members of one genus, these may be many or few, but it is beyond the reach of human forces to tabulate them in any way.

ATTEMPTS AT RAISING INTER-SPECIFIC HYBRIDS AT ISLEWORTH.

—A bare record of the few successes that have attended efforts at hybridization give no idea of the totality of effort required to produce even such meagre results. I have therefore tabulated a few of the crosses which I have attempted, and which were registered at the time. These do not represent one-half of the attempts I have made, because no register was kept, except in cases in which the swelling fruit gave promise of seed, and in hundreds of cases this did not occur. I have also practically eliminated the huge record of generic crosses attempted, none of which have, up to the present succeeded beyond possibility of dispute. I have defined for these purposes "a species" to be *a collection of individuals bearing evidence of a common parentage, in which all the important and easily recognizable attributes of the inflorescence and seeds are fixed, and which reproduce such characters in their seed progeny.*

Variations in the leaves or in the colour or markings of the flowers constitute varieties.

A specific hybrid, therefore, in my view, must differ *specifically* from the *female* parent.

A varietal divergence is not enough to *prove* hybridization, as self-fertilised seedlings of many pure species will show varietal divergence from the type in perhaps one per cent. to five per cent. of the seedlings.

In many cases where seeds have been raised after attempted hybridization, sufficient time has not elapsed for them to flower; in other cases they have flowered and shown no specific divergence from the female type.

In the former case SMALL CAPITALS indicate the supposed male parent; in the latter case **bold face** is used in the subjoined tabular matter; and *italics* indicate that no fertile seed was formed.

The total of results gives 159 registered attempts, of which 146 are absolute failures, and thirteen possible successes. Of these thirteen, I have hopes of success in three cases, and have undoubtedly succeeded in one case.

On this analysis it would appear, on the one hand, that the chances of really effecting hybridization is at the most not more than about two per cent., perhaps not more than 0.6 per cent.; and, by including unregistered attempts, these figures would be halved.

On the other hand, it should not be overlooked that my object throughout was not to register the correct percentage of possible hybrids between all the species in any genus, but rather to raise hybrids between species so far removed from each other as to make any offspring possess horticultural merit. In short, my aim was to do the difficult thing rather than the obvious.

Vallota x *Gastronema sanguineum* (died after germination).

Sprekelia x *H. rutilum* (2)* x *H. equestre* (2) x *H. procerum* (discontinued efforts, as plant never carries seeds with me. It is recorded to have once carried seed in Col. Trevor Clarke's garden).

Brunsvigia josephinae x *Vallota* (died after germination).

Amaryllis x LYCORIS SQUAMIGERA (3).

H. rutilum x *H. equestre* (2), x *Sprekelia* (4), x *vittatum* (died), x *Z. brachyandrum*, x *H. SOLANDRIFLORUM* (2). (*H. rutilum* carries seeds freely on its own or mongrel pollen.)

H. procerum x *H. aulicum* (2), x *Sprekelia* (carries seed on its own pollen).

H. equestre x *H. rutilum* x *Sprekelia* (2), x *H. vittatum* x *H. solandriflorum* x *Z. andersoni* (carries seed freely with mongrel pollen).

H. reginae x *H. solandriflorum* x *Z. brachyandra*.

H. stylosum x *H. SOLANDRIFLORUM*.

H. tricholepis x *H. vittatum* (2), x *H. rutilum* x *Sprekelia*

H. vittatum x *H. EQUESTRE* x *Z. candida* (seeds freely on its own pollen).

H. organense x *Z. brachyandra*.

H. aulicum x *H. VITTATUM* (4), x *Z. candida* (2), x *H. rutilum* x *H. procerum* (2), (seeds freely on its own or mongrel pollen).

Habranthus advenum x *H. aulicum* (never set seed).

C. moorei x *C. scabrum* x *C. odorum* (13), x *C. fimbriatulum* (3), x *C. CAMPANULATUM* x *C. zeylanicum* x *C. amabile* (8) (seeds freely on its own pollen).

C. scabrum x *C. MOOREI* (hybrid raised) (seeds on its own pollen).

C. odorum x *C. moorei* (23), (never carries seed).

C. amabile x *C. moorei* (3), x *C. giganteum* (2).

C. fimbriatulum x *C. moorei* (2).

C. giganteum x *C. zeylanicum* (5), x *C. odorum* (4), x *C. moorei* (2), x *C. amabile* (3).

C. zeylanicum x *C. giganteum* x *C. moorei* (2), (never seeds with me).

C. purpurascens x *C. moorei* (6), x *C. amabile* x *C. giganteum* (never seeds).

Ismene calathina x ELISENA

Elisena x CALATHINA x *Moritizina* (3).

Hymenocallis speciosa x *H. calathina*.

Eucharis lehmanni x *E. GRANDIFLORA* (seeds freely on its own pollen).

E. sanderi x *E. lehmanni* (2), (never seeds).

Zephyranthes brachyandra x *H. rutilum*, x *H. aulicum* (2), x *Hippeastrum* sp. (2), x SPREKELIA (2), x *Z. CANDIDA* (2), x *PLACEA ORNATA* (4), x LYCORIS SQUAMIGERA.

Z. rosea x *H. aulicum* x *H. reginae* (2), (seeds on its own pollen).

Z. carinata x *H. aulicum* (never seeds).

Z. gracifolia x *H. vittatum* (seeds on its own pollen).

THE USE OF ZEPHYRANTHES CARINATA IN HYBRIDIZING

REX D. PEARCE, *New Jersey*

Zephyranthes carinata is usually stated to be non-seeding, but I find that an occasional set may be obtained by persistent hand pollination. It seems to set seed more freely when it has a super-abundance of moisture at the roots, and lack of this may be the limiting factor in seed formation. It makes pollen freely, but has not so far proved to be a very successful parent in hybridization work. However, I have what may be a natural hybrid between *Z. carinata* and *Z. robusta*, although characteristics of the latter species are dominant.

*The figures in parentheses show the number of times that a particular cross was attempted.

THE NEHRLING HYBRID AMARYLLIS

HAMILTON P. TRAUB, *Florida*

The amaryllis enthusiast owes an undying debt of gratitude to the late Henry Nehrling (1853-1929) for his pioneer activities in amaryllis breeding in America. It was he who inspired Mr. Theodore L. Mead of Oviedo, Fla. in his highly successful work with a strain of the Nehrling Hybrids, which are now more generally available, especially in Florida, than any other strain.

Mr. Nehrling began his amaryllis breeding activities in the early 90's while he was living in Milwaukee, Wisconsin. His early efforts were limited since he carried on the work in a small green house. He continued the work more extensively during his residence at Gotha, Florida, 1906-1917, and at Naples, Florida, 1918-1929.

In the upbuilding of his strain he used introductions by the following breeders,—Veitch, 30 varieties; de Graff, 20 varieties; Williams, 10 varieties; James Douglas, 20 varieties. In addition he utilized a few varieties originated by Kenneth Finlayson, and also Johnsonii (*H. vittatum* x *H. reginae*), *Acramanii Pulcherrimum* (*H. aulicum platypetaium* x *H. psittacium*), *H. equestre*, *H. reginae*, *H. leopoldi*, and *H. solandriflorum conspicuum*. Indirectly through the named varieties by de Graff, Veitch and others, the species *H. pardinum* and possibly some other species entered into the strain.

Although his strain was undoubtedly as good as the best produced in America during his life time, his extreme honesty led him to admit as late as 1909 that the varieties with a short tube and open flower with a diameter from 8 to 12 inches (officially designated as the LEOPOLDI TYPE by the American Amaryllis Society) introduced by Veitch and Ker in England, and Bornemann in Germany, were superior to his own. It is of interest to note that when Nehrling first read the description of the variety Ideala (Veitch, 1897) he made an attempt to purchase it from the originator only to be informed that it had been sold. G. Bornemann, of Blankenburg am Hartz, purchased it for 60 marks, and raised from it his famous strain. Years later Nehrling received some of the progeny through Bornemann.

The development of amaryllis breeding and the extent of amaryllis culture have been profoundly influenced by the means of propagation employed,—by seedlings and offsets. Some of the best varieties were notoriously slow propagators. In Europe many named varieties were introduced before the Great War, but many of these apparently were not widely disseminated. In many cases the entire stock was sold to enthusiasts of commercial growers at fancy prices. In America, the main reliance was placed on propagation by seed and the bulbs were either sold as mixtures or were graded according to color after flowering and then disposed of at a higher price. Mr. Nehrling introduced only a very few named varieties; Mr. Mead introduced none. Mr. Mead apparently attempted to develop a strain which would reproduce fairly true from seed. His method consisted of crossing similar individuals—dark reds with dark reds; predominately whites with similar individuals; etc. Mr. Nehrling has left no exact record of his method of procedure. His primary aim was to produce a flower with a very short tube with petals all equal, 3½ to 4 inches in diameter, the entire flower wide open and measuring from 8 to 12 inches in diameter.

The amaryllis breeder of the present generation has as a foundation the rich mine of the Nehrling Hybrid Amaryllis. Considering the many species and important named hybrid varieties that have been used in building up this strain, the potential number of high type individuals to be raised from it should be great. Some of our contemporaries are already collecting the best individuals of the Nehrling and Nehrling-Mead strains. During the next decade these amaryllis breeders will undoubtedly make good use of this material in developing new strains of their own, thanks to the pioneer work of the late Henry Nehrling.

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THE MEAD STRAIN OF THE NEHRLING HYBRID AMARYLLIS

WYNDHAM HAYWARD, *Florida*

One of the most widely known and extensively propagated strains of hybrid Amaryllis (*Hippeastrum*) in Florida is that bearing the name of its originator, Mr. Theodore L. Mead of Oviedo, Fla. The Mead Strain of the Nehrling hybrid amaryllis is found in the planting stock of the great majority of the commercial growers of the state, from Pensacola east, and over the peninsula.

Its peculiar merits are so well recognized locally that numerous growers profess to handle only the pure Mead Strain. The name in Florida designates the standard stock for both amateur and professional growers. This strain is noted for the large size and desirable shape of flower and the wonderful variety of color variations and shades.

Mr. Mead, a naturalist and hybridizer of many species of plants, as well as a commercial fruit and vegetable grower and amateur horticulturist of note, is now past 80 years of age, and lives in Oviedo, in Seminole county, Central Florida.

His principal plant work, in cultural and hybridizing lines, has been with such subjects as the orchids, bromeliads, amaryllis, crinums, hemerocallis, gladioli, cacti, caladiums and fruit trees. His home at Oviedo is surrounded by a semi-jungle growth of palms, oaks, bamboos and other sub-tropical plants and trees. He maintains a greenhouse which contains many varieties of orchids and bromeliads in pots for use in hybridizing experiments. On the trees about his home numerous kinds of orchids, climbing cacti and bromeliads have been fastened to the bark. These have apparently been successfully naturalized.

It was with the aim of obtaining some definite information regarding the origin of the Mead Strain of hybrid amaryllis (*Hippeastrum*) that the writer and Dr. Hamilton P. Traub called on Mr. Mead at his home in the afternoon of April 22, 1933, and heard from the naturalist his own account of the beginnings of the strain of flowering bulbs that bears his name.

Mr. Mead said that some twenty years ago, the late Mr. Henry Nehrling, another noted naturalist and plant lover, of Gotha and Naples, Florida, gave him a bulb of "hybrid amaryllis", and that when the bulb flowered, he wrote to Mr. Nehrling, asking for pollen of other hybrid amaryllis, and Mr. Nehrling sent him some from his extensive collection of the best European hybrids. According to Mr. Mead, he pollenized his single amaryllis and from the seed that set as a result of this pollenization, he grew 180 seedlings. This was the beginning of the *Mead Strain*. Mr. Mead pollenized these seedlings, when they grew to blooming size, with pollen received from Mr. Nehrling who had assembled a large collection of *Hippeastrum* species and the best European hybrid amaryllis and had also done some pollination work himself in the line of creating new hybrids since the 90's. This pollen from Mr. Nehrling's finest specimen flowers was used to build up the great variety of types and colors in the *Mead Strain*.

As the years went by, Mr. Mead said, he selected six main types for his stock, including the lightest, the darkest, those with hair lines of color, a tape of color about the flower, etc., and he confined his hybridization work to the development of these most desirable characteristics. He made other visits to Mr. Nehrling at blooming time and brought back pollen from choice flowers from the latter's collection at Gotha, Florida, for use in the crossings. Mr. Mead, however, introduced no named varieties of hybrid amaryllis.

The quality and characters of the *Mead Strain* of hybrid amaryllis gradually became known to bulb growers and dealers all over the state and elsewhere and the demand for the bulbs in large quantity increased until Mr. Mead was raising many thousands. At length he sold his main stock, keeping only seven hundred or so of the choice specimens for his personal collection. These he still has, and he continues to grow them in a small way mainly for his own interest and diversion.

In recent years the bulbs in his collection, from long growing on the same soil and difficult growing conditions, have suffered from a disease called "red wilt" or "red rust". Mr. Mead has been unable to give his collection all the time he could wish to keep them in maximum exhibition condition. However, on the visit

of the writer and Dr. Traub, the naturalist showed them many fine specimens in bloom, surpassing some of the best among many thousands seen in the bulb fields of other growers propagating the *Mead Strain*.

Mr. Mead said that after the main stock of his bulbs passed from his hands, they were distributed between two large growers who continue their sale and propagation, mainly by seed, to this time on a greatly increased scale.

The naturalist is a graduate of Cornell University (class of 1877), where he specialized in civil engineering, as a "practical anchor to windward". But he immediately gave up all thought of practicing his profession on coming to Florida a half century ago. He was an ardent collector of butterflies in his youth, and had a large collection of the North American species. Despite his advanced age, he lives an easy, natural life, mostly in the open air and under the Florida sun, and can step across his planting grounds with a speed that would tire many younger men. He is interested in Boy Scout work and still is Assistant Scoutmaster at Oviedo, having formerly been Scoutmaster for many years. He keeps up a lively interest in national affairs, books, and all things relating to human welfare.

HISTORY OF THE AMARYLLIS COLLECTION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Plant Industry, *United States Department of Agriculture*,
Washington, D. C.

The United States Department of Agriculture's present collection of 2,500 bulbs of *Hippeastrum* hybrids, commonly referred to as amaryllis, was developed by successive cross-pollinations from the following twelve named varieties which were imported from England July 31, 1909; *Diana*, *Venus*, *Serapis*, *Progress*, *Achilles*, *Crimson King*, *Vesta*, *Virgin Queen*, *Monarch*, *Bacchus*, *Adonis*, *Scarlet King*. The colors of these varieties comprised dark red, rose, pink, blush, and white with red stripes.

When these bulbs flowered, Mr. E. M. Byrnes, then Superintendent of the Department of Agriculture greenhouses, undertook by cross-pollination to develop shades not included in the colors of the original flowers. The handling of the bulbs in this process was as follows:

February 14, 1910. The flowers were pollinated.

March 26, 1910. The ripened hybrid seed was gathered.

March 29, 1910. The seed was sown in seed boxes.

June 2, 1910. The seedlings were shifted from seed boxes to 2-inch pots.

August 22, 1910. The seedlings were shifted from 2-inch to 4-inch pots.

January 16, 1911. The seedlings were shifted from 4-inch to 6-inch pots.

November 22, 1911. The seedlings were shifted from 6-inch to 8-inch pots.

March 5, 1912. The seedlings were in full flower.

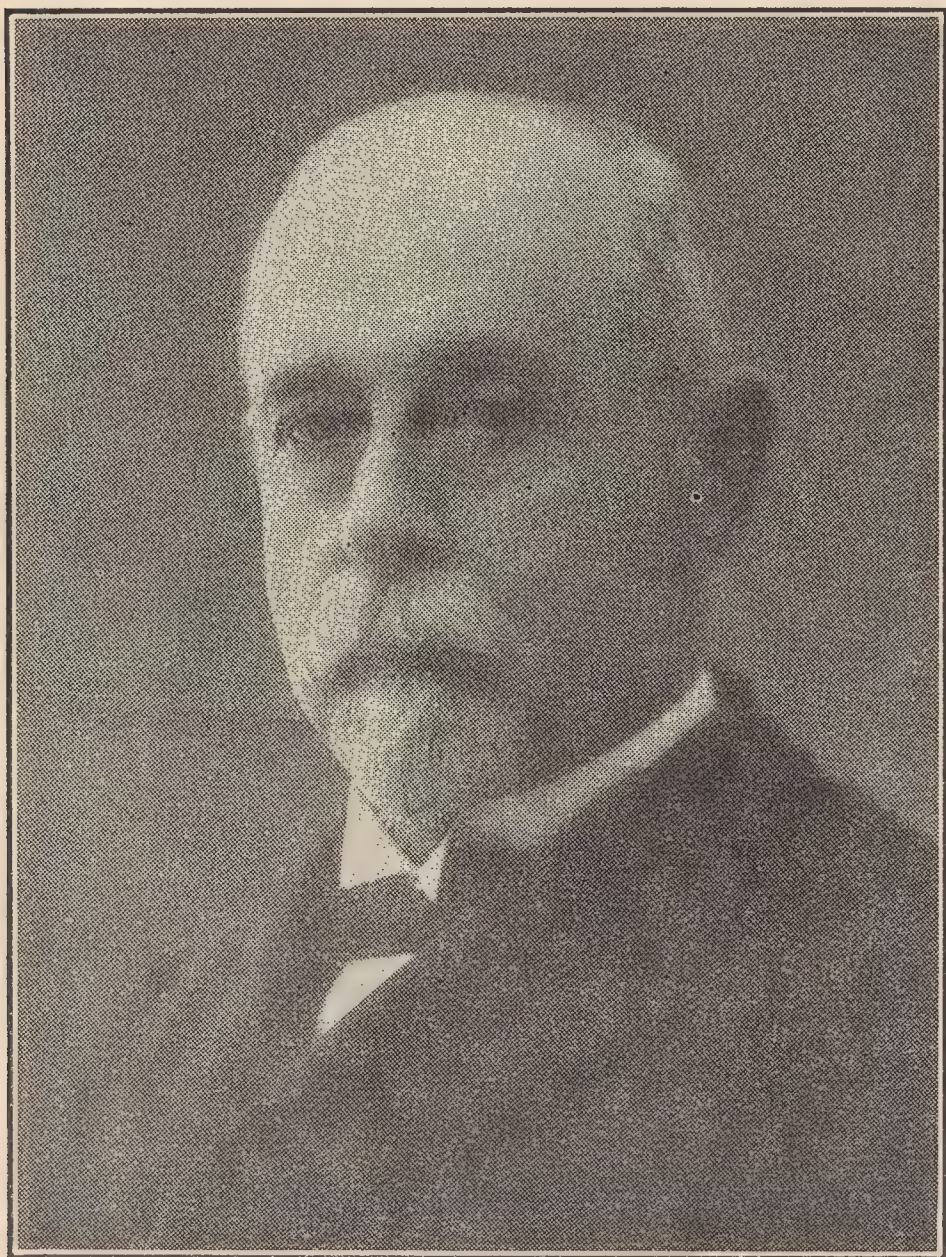
The same treatment was followed in the cross-pollinations conducted each subsequent year.

The cross-pollinations for the developing of new shades were progressing successfully, so Mr. Byrnes turned his attention to the problem of producing a pure white amaryllis. The first cross in this endeavor was made between a red-striped white bulb and an orange-striped white bulb. In about two years' time the resulting seedlings bore flowers, of which the two showing the most white were crossed. The seedlings resulting from this cross were grown to flowering size bulbs, and the process was repeated. All the bulbs resulting from these crosses bore lighter flowers than the parent bulbs, and from the third cross, which was made early in February, 1918, two bulbs were obtained which bore white flowers in March 1920. These flowers were small and not pure white, but successive selection and cross-pollination have brought about realization of the aim to produce a fine-size white amaryllis.

In 1914 Mr. Byrnes, desiring to devote his entire attention to the producing of the white amaryllis, turned over to his son, J. Wise Byrnes, who was associated

with him, the cross-pollinating of amaryllis for the purpose of obtaining new shades. Mr. J. Wise Byrnes succeeded his father as Superintendent of the Department of Agriculture greenhouses January 1, 1924, and since that time he has carried on all the amaryllis hybridizing. With the flowering of each new collection of seedlings the white is improved, new and subtle variations of shades appear, and an increase in the size of the flowers is noticeable. Cross-pollination is being continued to improve existing types and to obtain new colors, more shades, and a further increase in the size of the flowers.

IN MEMORIAM—DR. ATTILIO RAGONIERI



DR. RAGONIERI

It is with the deepest regret that we report the death of Dr. Attilio Ragonieri of Florence, Italy, on October 11, 1933. He was noted for his professional writings in the field of Medicine and his highly successful work in plant breeding which latter he carried on as a hobby.

His chief originations consisted of improved freesias, ranunculi, callas, hybrid amarylleae, lily-of-the-valley and various fruits. In describing a most interesting introduction, the bigeneric hybrid, *Crin(o)donna Corsii*, (*Amaryllis belladonna* x *Crinum moorei*), he states,*—

“Botanists will perhaps not deal too harshly with the creation of a new genus for this bigeneric Amaryllidaceous hybrid. . . . The illustration represents the original specimen (spoiled by a wind storm), upon which the following description has been made:

“CRINDONNA MEMORIA CORSII.—New Hybrid: Plant evergreen, the chief period of vegetation occurring at the end of summer. Bulb—8-9 cm. in diameter, ovoid, with rather fibrous tunic, plentifully proliferous, with a neck about 15 cm. long. Leaves 10-12 to a bulb, drooping sometimes, showing a tendency to be distichous, dark green, more or less carinate, 3-4 cm. broad, 70-90 cm. long. Peduncle—stout, compressed, green, with a purplish tone at the base, lightly glaucous, 50 cm. long. Spathe valves—about 13 cm. long, 3 cm. broad, with a rose coloured stripe occupying the third central portion in its whole length. Flowers—8-12 in an umbel, 18 cm. long including the pedicle, 10 cm. broad. Perianth with a slightly curved tube, 14 cm. long; segments acuminate, the three external ones 2 cm. broad, the interior ones 3 cm.; colour pinkish rose, more deep in the center of the segments and at their apex. Filaments—shorter than the corolla and of the same colour. Anthers—linear. Style—rather shorter than the perianth, colour dark rose pink. Stigma—trifid. Flowering time, August.

“I have dedicated this new hybrid to the venerated memory of the late Marquis Bardo Corsi Salvati, of Florence, the enthusiastic and very intelligent lover of fine plants, who had formed in his gardens at Sesto the most complete collection of stove and other plants in Italy.”

* Gardeners' Chronicle (London), Jan. 15, 1921.

HIPPEASTRUM AND CRINUM HYBRIDS

CECIL E. HOUDYSHEL, *California*

I have raised quite a number of *Hippeastrum* seedlings, hardly more than 10,000 though on a guess. My seeds were very carefully selected and usually the result of hand pollination. I have produced a few very good seedlings. Most of the best that I have raised I have lost through gopher injury, dishonest employees, economic depression, etc. I hope that I can help yet a little more toward the improvement of the horticultural forms of the Amaryllaceae.

The *Crinum*, *Cecil Houdyshel*, was selected as the one best from about 600 seedlings of the same cross. It is the most profuse bloomer here that I have ever seen. I have flowers on it today (January 16). I have them in every month of the year in my garden and field. I do not give them much care. My new *Crinum*, *Virginia Lee*, which has produced about 25 bulbs, large and small, to date, bloomed first about four years ago. So you see that it multiplies rapidly. Although *Virginia Lee* is related to *Cecil Houdyshel* it is quite distinct. Its foliage is like *J. C. Harvey*.

THE BURBANK HYBRID AMARYLLEAE

WYNDHAM HAYWARD, *Florida*

The Burbank Strain of hybrid Amaryllis, at one time one of the leading strains in the United States, and the product of long continued experimentation and hybridization by the late Luther Burbank in California during the first two decades of the present century, seems to have fallen into neglect. The contributor of this article has had great difficulty in obtaining authentic information regarding the origin, development and dissemination of this Strain of hybrid *Hippeastrums*, and has had to fall back on material available in Mr. Burbank's own works published in 1914. It would appear from this source that among his originations were not only outstanding hybrid *Hippeastrums* but also a number of *Crinum* hybrids, and some bi-generic crosses.

HYBRID HIPPEASTRUMS. The plant breeding method employed by Mr. Burbank was based on the selection of the best individuals having the desired characteristics to the highest degree and then cross pollenizing these. He reports some difficulty at first until he discovered that the pistil of the flower matures after the stamens are ready to shed their pollen. The proper time for transferring the pollen, it is pointed out, is when the flower is beginning to fade.

Mr. Burbank began his *Hippeastrum* breeding with the following,—*Johnsonii*, *H. reginae*, *H. aulicum*, and later on he had several other species available. The objectives are set forth as being the attainment of strong stalks, broad leaves, abundant flowering, rapid propagation capacity, large bulb size, large flowers with wide petals and brilliant colors. It is of interest to note that after about 14 years of work his introductions were characterized by a flower size of 10 inches or more in diameter.

OTHER AMARYLLEAE. In connection with the *Hippeastrum* hybridization work, he sets forth the claim that he crossed *Sprekelia formosissima* with his *Vittatum Type* hybrid amaryllis. He states that he grew *Sprekelia* bulbs for 20 years, raising "probably a hundred thousand seedlings," but during this time he succeeded only once in hybridizing the plant. Only one individual of the union bloomed, he claims, and from this one numerous seedlings were grown. In the above case *Sprekelia* is claimed as the pollen parent but he explains that later he made a number of crossings on *Sprekelia*, using pollen from an improved hybrid *Hippeastrum*.

In the first case, he states that the offspring were almost infertile, and seldom set seed; the plants and leaves similar to the *Sprekelia*, but with blossoms larger than those of the *Sprekelia* and with curiously twisted petals. Second and third generations from his second series of crosses between *Sprekelia* and hybrid *Hippeastrum* showed a tendency to revert back to the hybrid Amaryllis type.

Mr. Burbank writes that he had grown about 20 species of *Crinum* and mentions specifically, *Crinum moorei*, *C. longiflorum*, *C. americanum*, *C. amabile*, *C. asiaticum*. He states that he had sold a number of hybrid varieties of *Crinum*

to the trade. These seem to have been nearly all lost, at least as products of Mr. Burbank's hybridizing.

Mr. Burbank describes the better type of hybrid *Crinum*s as "a really splendid group of bulbous flowering plants." He mentions flower stems six feet long and flowers ranging from white through rosy pink to almost purple. He states that he experienced no difficulty in crossing the various species of *Crinum*, mixed hybrids being finally produced that represented combined characters of many species. The seed parent in most cases, he informs us, was *C. americanum*, the native Southern species, but in a few cases *C. amabile* or *C. asiaticum* was used.

CRINUM-AMARYLLIS BELLADONNA HYBRIDS. In Luther Burbank's works, published in 1914, are reported bi-generic crosses between a *Crinum* species and *Amaryllis belladonna*. Similar crosses are reported by Dr. Attilio Ragionieri of Florence, Italy, in *Gardeners' Chronicle* (London) January 15, 1921, which he named *Crindonna Memoria Corsii*, and by the firm of Howard and Smith, of Montebello, California, in *Gardeners' Chronicle* (London) November 21, 1925, which was named *Amarcrinum howardii*.

Both the Ragionieri and Howard crosses were made between *Crinum moorei* and *Amaryllis belladonna*. Mr. Burbank apparently does not name the species of *Crinum* he used!

THE HEATON HYBRID AMARYLLIS

I. W. HEATON, *Florida*

Six years ago we made a survey among the commercial florists regarding the Amaryllis as a commercial flower. The two main objections were, inability to produce timed bloom and the high percentage of poor colored stock. From the results of this survey, we made the specifications of the Heaton Strain, (a) rapid growth; (b) evergreen foliage; (c) rapid production by offshoots; (d) clean clear colors; (e) uniform, medium sized, well shaped bloom; (f) wide, even, recurved petals; and (g) the ability to produce at least 400 blooming size bulbs in four years by vegetative propagation.

To produce this strain we used the first year 200 Mead Strain, three inch, two year old, selected seedlings from Mr. Mead's original collection, purchased from Mr. Bender, Sanford, Florida; and also about 75 bulbs purchased from several local growers. The method of breeding followed was,—*Leopoldi Type* male to *Mead Type* female, color to color. The seeds were kept separate according to twelve flower colors. Twenty two months later, from 19,000 seedlings, over 5,000 bloomed. The bulbs were carefully checked in the field and only about 250 were removed to the seed house. These were perfect in every way and showed a definite improvement over their parents. This spring our seedlings from the United States Department of Agriculture, Bureau of Plant Industry, bloomed at twenty months of age. These large *Leopoldi Type* bloom furnished us the pollen to produce 130,000 seed bred to the seedlings produced by the first cross.

We claim no credit for the scientific breeding of this strain; it is really a selection of the cream of nearly 500,000 bulbs we have raised.

We do claim greater vitality. Every bulb in this strain has for three generations on both sides produced commercial bulbs in two years from seed. Our strain is 100 percent evergreen in Florida, since the *Vittatum* blood has been eliminated in so far as it affects dormancy. All *H. psittacinum* type of bloom has been rogued out and the *H. leopoldi* and *H. reticulatum* blood has been brought to the fore. While the *H. equestre* characteristics of multiplication by offshoots has been combined with the *Leopoldi Type* flower. The bloom of the Heaton Strain is a modification of the *Leopoldi Type*; the petals are wider at the tip and recurved toward the base, giving the bloom a more rounded appearance.

We wish to acknowledge our obligation to Mr. Mead of Oviedo, Florida; to the late Mr. Henry Nehrling; and to the U. S. Dept. of Agriculture officials in Washington, D. C. who have by their work made our strain possible. Mr. E. P. Hall, retired florist of Shelbyville, Ky., furnished us much inspiration and many valuable hints during the production of this strain.

THE DIENER HYBRID AMARYLLIS

RICHARD DIENER, *California*

The writer has been very much of an amaryllis enthusiast for many years. Breeding operations with the purpose of improving this class of plants have been carried on with two distinct strains; (a) a Mammoth Strain, built up from hybrid amaryllis (*Hippeastrum*) of the extra large flowered type, secured directly or indirectly from European breeders, and (b) *Hippeastrum equestre* hybrids produced by crossing this species with his *Mammoth Hybrids*.

The breeding method followed consisted of crossing individuals having the desired character (size, shape and color of flower, longest flowering season, rapid propagation capacity, etc.) to the largest degree, among a particular population, with other similar individuals.

Mammoth Hybrids. At the start attention was directed to the size character, and when some of the seedlings flowered during the summer after they had already flowered during the winter it seemed logical to secure individuals having both of these desirable characters. Thereafter all the effort was expended on individuals which flowered several times each year and also produced round flowers with a short tube and which were self colored. The results have been well worth while for some of the progeny flower several times each year and produce flowers over 10 inches in diameter. The colors are also quite marvelous. They cover those common to amaryllis, excepting yellow and blue. The attempts to produce a pure white variety possessing the other desirable characters have also been successful.

The *Mammoth Hybrids* described above should not be dried off but kept growing continually since flower scapes may appear almost any time during the year. However, in March and April, all which have received sufficient care will surely flower. The writer's plants are being grown under lath with the exception of the most rare which are raised in pots in the greenhouse.

Equestre Hybrids. About twelve years ago the firm of John Lewis Childs offered a so called "Everflowering" strain of amaryllis. The writer secured a dozen of these bulbs. As they were not referred to any definite species it was not possible to identify them until a visiting Florida grower kindly informed us that they were apparently *Hippeastrum equestre*.

Only one of the bulbs produced a flower scape during the first year. This was used to best advantage by crossing with the *Mammoth Hybrids*. The result was quite pleasing as the seedlings grew like weeds and propagated very rapidly. This spring the third generation of these crosses are coming into flower which will include many crosses for all kinds of purposes. This should add to the present collection which contains colors not in the *Mammoth Hybrids* such as orange, salmon, copper red and some with yellow centers.

A PALE BLUE ZEPHYRANTHES FROM THE ARGENTINE

One of the chief objects of the American Amaryllis Society is the importation of promising Amaryllaceae species for the hybridizer. As a beginning in this endeavor we are happy to report that our correspondent, Sr. Jose F. Molfino, of the Argentine Ministry of Agriculture, writes under date of Sept. 18, 1933,—“The species, *Zephyranthes caerulea* is included in the Flora of Argentine, having been noted in the Province of Entre Rios by Helmberg and Pax . . . the undersigned (Sr. Jose F. Molfino) and the other naturalists of the Laboratory will be glad to gather bulbs. . . . on their botanical expeditions and will send them to the American Amaryllis Society for cultivation.”

The species *Z. caerulea* is described as follows by Baker, 1888: *Z. caerulea* Baker. *Amaryllis* (*Habranthus*) *caerulea* Griesb.—Bulb under 1 inch diameter; neck 1-2½ in long. Leaves unknown. Peduncle 3-4 in. long. Pedicle as long as the bifid spathe. Perianth pale blue, an inch long; tube none; segments obovate-unguiculate, mucronate. Stamens unequal; 3 longer equalling the trifid style.

Hab. Entre Rios; Conception del Uruguay, flowering in March, Lorentz.

—HAMILTON P. TRAUB, *Florida*.

AMARYLLIDACEAE NATIVE TO JAPAN

BASIL N. IKEDA, *Japan.*

CRINUM ASIATICUM

Below is given a list of the Amaryllidaceae native to Japan. They are not widely cultivated except *Crinum asiaticum* var. *japonicum*, and *Lycoris squamigera*. These latter are grown outdoors in the garden or indoors in pots. There are hardly any horticultural varieties, and the trade in these two species is not extensive. However, some of the other species in the list have important possibilities if improved by scientific plant breeding.

The writer will submit photographs of some of the more important species for reproduction in a future issue of the Year Book.

***Crinum asiaticum* var. *japonicum*.** Native to Hondo (Central to South), Kiushu, Shikoku; habitat—sandy beaches; fragrant flowers produced in summer.

***Crinum asiaticum* var. *sinicum*.** Native to Taiwan (Formosa); habitat—near the seashore; flowers in summer; corolla tube and segments much longer than var. *japonicum*.

***Curculigo orchoides*.** Native to Shikoku, Lukyu and Taiwan (Formosa); both bi—and unisexual yellowish flowers in summer.

***Hypoxis aurea*.** Native to Hondo (Central to South). Kinshu, Shikoku, Lukyu and Taiwan (Formosa); habitat—mountains and fields; yellowish flowers in summer.

***Lycoris albiflora*.** Native to Kiushu? White flowers in September; probably a white form of *L. radiata*.

***L. aurea*.** Native to Shikoku, Lukyu, and Taiwan (Formosa); habitat—near beaches; flowers bright yellow.

***L. radiata*.** Native to Hondo, Kiushu, and Lukyu; habitat—fields; vivid red flowers in September.

***L. sanguinea*.** Native to Hondo, Shikoku and Kiushu; habitat—woodland, and field in mountains; bright red flowers in early summer.

***L. squamigera*.** Native to Hondo (Central to South) and Kiushu; habitat—woodland and field in mountains; light purple or pink fragrant flowers from early to mid-summer.

GENETIC AND CYTOLOGICAL RESEARCH
IN THE AMARYLLEAE*THOMAS W. WHITAKER, *Massachusetts*

To those of us who use the microscope for the investigation of problems of heredity and associated cell phenomena, the members of the Amaryllaeae are an exceptionally attractive group of plants. The cells making up the various organs and

* Editorial Note—The work in which Mr. Whitaker is engaged is of very great importance to those interested in the Amaryllaeae. Some of the members have already taken steps to cooperate in this excellent work and are sending blooming size bulbs of species and varieties to be used in Mr. Whitaker's investigations. All are urged to cooperate to the fullest possible extent. His address is *Arnold Arboretum, Harvard University, Jamaica Plain, Massachusetts.* —Ed.

tissues in plants of this group are, generally speaking, quite large. The tiny elements in which we are most interested, namely, the chromosomes, are comparatively large and with few exceptions, not numerous.

From the point of view of the theoretical plant breeder, there are several points of interest in the Amaryllaeae. Two deserving of mention are: (1) Interspecific crossing can be accomplished fairly easily in a great many species of this group. One needs only to mention the genus *Hippeastrum* to illustrate a well known example of this tendency. (2) There are a number of cases of bigeneric hybrids recorded in the literature. Two examples of wide crosses of this sort are the reported hybrids of *Amaryllis* and *Crinum*; *Amaryllis* and *Brunsvigia*.

In considering the genetic possibilities of a group of plants, the plant breeder always finds rather serious handicaps as well as certain advantages. This is true of the Amaryllaeae. Perhaps the most serious obstacle in the path of genetic research in this group is the *time element*. The period between germination and flowering is considerable in most species. In some cases the length of this period may be as much as 22 years (species of *Brunsvigia*). From a genetic standpoint the large number of seed, which, in most cases, can be secured from a single pollination, is a decided asset.

The above remarks convey some idea of the interesting problems in this group, awaiting investigation by those who are skilled in the use of the microscope and in the technique of plant breeding. It is practically a virgin field as far as this type of work is concerned. An investigation in these fields may be expected to yield worth while results, interesting to all those concerned with the Amaryllaeae.

The first problem to be met in undertaking a project of this nature is the assembling of authentic material of as many species as possible. By a study of such material it should be possible to determine, by cytological methods, the relations existing among the various genera and to form a background for future genetic research.

To make reasonable progress with such a project, the cooperation of a group of interested individuals is highly desirable, if not essential. It is to secure the cooperation of these who may be interested that the above project has been outlined at the present time.

AMARYLLEAE AND ALSTROEMERIEAE IN AMERICAN BOTANIC GARDENS

In the following list the species and horticultural forms of the *Amaryllaeae* and *Alstroemerieae* in the *Missouri (St. Louis) Botanic Garden* (M)*; the *Brooklyn (New York) Botanic Garden* (B)*; and the *New York Botanic Garden* (N.Y.)* are indicated. Several of the American private collections also contain valuable material of this nature.

The Northern botanic gardens are to be congratulated on their efforts since most of these plants must be grown under greenhouse culture with them.

There is a real need of bringing together representative collections in the South,—Florida, Louisiana, Texas, and other southern states, and also in California.

AMARYLLEAE

Coronatae

Narcissus species and hybrids. M; B; NY.

Amaryllaeae Genuinae

Galanthus nivalis. M.
Cooperia drummondii. NY.
Lecucojum vernum. M.
Sternbergia lutea. B; NY.
S. clusiana. B.
Zephyranthes texana. B.
Z. atamasco. B.
Sprekelia formosissima. NY.

Lycoris squamigera. M.
Hippeastrum equestre. B.
H. brachyandrum. NY.
H. advenum. NY.
H. reticulatum. NY.
H. Hybrids. M; B; NY.
Vallota purpurea. NY.
Cyrtanthus spiralis. M.
Clivia miniata. M; B.
Haemanthus albiflos. B.
H. ratheri. NY.
H. punceus. NY.
H. katherinae. NY.
Crinum longiflorum. M.

C. longifolium. NY.
C. longifolium album. NY.
C. giganteum. M; NY.
C. asiaticum. M; NY.
C. asiaticum sinicum. NY.
C. erubescens. NY.
C. roozenianum. NY.
C. podophyllum. NY.
C. pendunculatum. NY.
C. eleanorae. NY.
C. caribaeum. NY.
C. fimbriatulum. NY.
C. campanulatum. NY.
C. moorei. NY.

(Continued on page 98)

* Abbreviations used in the list

5. Amaryllaceae Propagation

THE GROWING OF AMARYLLIS FROM SEED

*Bureau of Plant Industry, United States Department of Agriculture
Washington, D. C.*

The seeds of amaryllis should be planted 1 inch apart each way in trays 3 inches deep, in a light soil consisting of three parts good friable loam and one part leaf mould with a sprinkling of clean, sharp sand, thoroughly mixed and screened. They should be placed in the light in a temperature of between 60 and 65° F. Immediately after planting they should be given a thorough watering. After the first watering, only sufficient water should be given to keep the soil moist. Care must be taken not to apply water too freely as it is liable to cause the development of a fungus which would destroy the seeds.

When the seedlings have developed two leaves about 3 inches long, they should be potted in 3-inch pots in a soil consisting of three-fourths good friable loam and one-fourth well-rotted cow manure, with a good sprinkling of sharp sand, thoroughly mixed. The seedlings can now stand a temperature of from 50 to 65° F. When the 3-inch pots are filled with roots, the plants should be shifted into 5-inch pots, and from the 5-inch to 7-inch or 8-inch pots, in which size the bulbs are flowered. When the seedlings are shifted into pots larger than 3-inch pots, the pots should be well drained with an inch of clean cinders about the size of small marbles, clean gravel, or broken flower pots. Over the hole in the pot should be placed a piece of the material used for drainage of a size sufficiently large to cover the hole. When the seedlings are shifted from 3-inch to 5-inch pots and into the larger sizes, care should be exercised to leave at least two-thirds of the bulblet above the surface of the soil.

Each time the bulblets are repotted, immediately sufficient water should be applied to penetrate all the soil in the pot. After this water should be withheld until the soil becomes dry. After each shift into larger pots the bulblets will not require a great deal of water until the root systems are developed and established, which will usually be in about three weeks. After that time a thorough watering should be given every day. The plants are grown on without a check or rest until the bulb reaches the flowering stage.

After the bulbs have been shifted into the pots in which they are to flower, an application of a well-balanced fertilizer every ten days will be beneficial. The amount of fertilizer to be used will depend upon the size of the pot in which the bulb is placed and upon the nature of the fertilizer. Fertilizer should be withheld from the time the flower bud shows color until the blooming period is over and the flower stem has been removed. When the flower has withered, the stem should be cut with a sharp instrument about 2 inches above the bulb.

After the bulb has flowered, the offsets which have developed around it should be removed. To accomplish this, the bulb should be knocked out of the pot and all soil removed from it, care being taken not to injure the root system. The offsets should not be cut off but should be very carefully pulled off by hand. The offsets should be handled in accordance with the Department's instructions for the treatment of amaryllis offsets. The bulb should be repotted in the same pot and continued in active growth with applications of fertilizer every 10 days.

In early autumn, when the foliage begins to turn yellow, all fertilizer should be discontinued and watering gradually decreased until the soil has become entirely dry at which time the foliage will have entirely dried back. The bulb should be left in the pot and stored in a dry place in a temperature of between 40 and 50° F. The pot should be placed on its side. No water should be given during the dormant period. The potted bulb should be left in this condition until the bulb of its own accord shows a flower bud. The bud usually emerges from the side of the bulb and not from the center and generally appears in the late winter or early spring. When the flower bud appears the pot should be set upright and placed in the light in a

temperature ranging from 50 to 65° F. A thorough watering should be given at this time and continued each day until the dry soil has absorbed sufficient water to expand and hold moisture. After this the watering each day should not be quite so heavy. After the flower bud has emerged entirely from the bulb, fertilizer should be applied every 10 days until the bud shows color when it should be discontinued until after the flower stem has been removed. Following the blooming period, the application of fertilizer should be resumed and continued through the summer. When the foliage turns yellow, the bulb should be rested in accordance with the instructions given above.

Once in about five years, immediately after the bulb has gone out of flower, the bulb, soil, and drainage should be removed from the pot, care being taken not to injure the roots of the bulb. The pot should be thoroughly cleaned and clean drainage placed in it. The bulb should be repotted in fresh compost prepared in the proportions given above for the potting of amaryllis.

THE TREATMENT OF AMARYLLIS OFFSETS IN THE HOME

*Bureau of Plant Industry, United States Department of Agriculture
Washington, D. C.*

Amaryllis offsets should be firmly potted in a soil consisting of three-fourths good friable loam and one-fourth well-rotted cow manure, with a good sprinkling of sharp sand, thoroughly mixed. The size of the pot used will depend upon the diameter of the offset. The pot should be large enough to allow a space of from 2 to 2½ inches all around between the offset and the edge of the pot. The pots should be well drained with an inch of clean cinders about the size of small marbles, clean gravel, or broken flower pots. Over the hole in the bottom of the pot should be placed a piece of the material used for drainage of a size sufficiently large to cover the hole. In potting the offset, care should be exercised to leave at least two-thirds of it above the surface of the soil.

Immediately after potting, sufficient water should be applied to penetrate all the soil in the pot. After this, water should be withheld until the soil becomes dry. The offset will not require a great deal of water until the root system is developed and established. This will usually be in about three weeks. After that time, a thorough watering should be given every day. The bulb should be placed in the light in a temperature ranging from approximately 50 to 65° F.

The plants should be allowed to grow through the summer and early autumn until they have ripened their growth which will be marked by the leaves turning yellow. At this time the watering should be gradually decreased until the soil has become entirely dry at which time the foliage will have entirely dried back. The offsets are now entering their dormant period. During this time they should be left in the pots and stored in a dry place in a temperature of between 40 and 50° F. The pots should be placed on their sides. No water should be given. The potted offsets should be left in this condition until they start into active growth of their own accord.

The starting of the offset into active growth will be marked by the appearance of leaves from the center of the offset and will usually occur in late winter or early spring. The pot should then be set upright and placed in the light in a temperature between 50 and 65° F. A thorough watering should be given and continued each day until the dry soil has absorbed sufficient water to expand and hold moisture. After this the watering each day should not be quite so heavy. Application of a well-balanced fertilizer every ten days will be beneficial. The amount of fertilizer to be used will depend upon the size of the pot in which the offset is placed and upon the nature of the fertilizer. The offset should be continued in active growth throughout the summer and early fall. When the growth is ripened the applications of water and fertilizer should be discontinued and the offset should be rested in accordance with the instructions given above for the dormant period.

At the end of the second dormant season the offsets will usually have developed into flowering bulbs. This will be indicated by the appearance of a flower bud from the side of the bulb. The bulb should then be brought into the light, watered and handled in accordance with the instructions for the second season of active growth given above. When the flower bud shows color however, fertilizer should be withheld until the blooming period is over and the flower stem has been removed. When the flower has withered, the stem should be cut with a sharp instrument about 2 inches above the bulb. After this the application of fertilizer should be resumed and continued until the foliage has ripened its growth. The bulb should then be rested until the appearance of next season's flower bud.

Once in about five years, immediately after the bulb has gone out of flower, the bulb, soil, and drainage should be removed from the pot, care being taken not to injure the roots of the bulb. The pot should be thoroughly cleaned and clean drainage placed in it. The bulb should be repotted in fresh compost prepared in the proportions given above.

EXPERIMENTS IN THE PROPAGATION OF AMARYLLEAE BY CUTTAGE

HAMILTON P. TRAUB, *Florida*

The literature on the vegetative propagation of the Amaryllae is not very extensive. In 1926, Miss Luyten (1)* in Holland, reported successful experiments with the propagation of hybrid amaryllis by placing bulb scales in a propagation medium and keeping the temperature at approximately 80 degrees F. The Missouri Botanic Garden (2) repeated part of Miss Luyten's experiments and reported encouraging results in 1927. Traub, in 1933, reported success in the propagation of hybrid Amaryllis by partially or completely quartering the bulbs vertically and planting the fractions in pots under ordinary flat shed propagation conditions in Florida (3). Mr. I. W. Heaton, of Orlando and Mr. Wyndham Hayward of Winter Park, Florida, have also experimented with the propagation of amaryllis by cuttage. Mr. Hayward used chiefly *Hippeastrum equestre*, and Mr. Heaton made use of hybrid amaryllis. It is reported that Mr. Bender of Sanford, Florida, has also used the cuttage method. Possibly still others have experimented in this field.

This paper is in the nature of a progress report since the experiments reported on are not completed. In the case of the experiments previously reported (3), the Nehrling-Mead strain of hybrid amaryllis (*Hippeastrum*) was used. As indicated in Table 1, blooming size bulbs were cut (a) lengthwise into quarters as far as the middle of the root base, and (b) into quarters. A variation was introduced in each of the two types, consisting of cutting off a little less than half of the top of the bulb before making the lengthwise cuts.

The two "callusing-sprouting" media used were sand and loam. The partially quartered bulbs, and the quarters were planted in these media contained in clay pots. Moderate water was applied until growth had definitely started. Any flower buds already formed in the fractions expanded and flowered, and leaf growth appeared above the surface in some cases in less than 30 days. In three months the original ten bulbs had given rise to 15 new bulbs, an increase of 50 per cent. In another month the number of new bulbs had increased to 43, an increase of 330 percent as shown in Table 1.

On inspection it was noticed that new bulbs had been formed at the leaf axes. The roots, however, issued from the root base fraction of the mother bulb. Roots were more abundant and longer in case of partial quartering. Complete serving apparently retards root formation. The partially quartered bulbs had entirely or practically broken into quarters by the pressure of the developing new bulbs. Where still slight connections were present, these were broken at transplanting time. The sand "callusing-sprouting" medium gave disease-free plants, as contrasted with some red rust on plants propagated in loam.

*Reference is made by number (Italic) to Literature cited at end of article.

Table 1. Vegetative propagation of hybrid Amaryllis; Nehrling-Mead Strain; Cuttage in spring, 1933.

Treatment	Sprouting Medium	Date set up	No. Bulbs	Sprouts above ground		
				6-19-33	6-30-33	8-10-33*
Upper part of bulb cut off cross-wise, a little above center, and lower half cut length-wise into quarters half way thru root base; all cut surfaces covered with paraffin	Orlando	3-24-33	2	4	5	7
	sandy loam			1	2	2
Bulb cut lengthwise into quarters half way thru root base; stem and root base only covered with paraffin	Orlando	4-6-33	2	1	1	4
	sandy loam			0	0	3
	Sand	4-6-33	1	1	2	5
Total			5	7	10	21
Upper part of bulb cut off cross-wise a little above center, and lower half cut length-wise into quarters; all cut surfaces covered with paraffin	Orlando	3-24-33	2	3	3	3
	sandy loam			3	4	5
Bulb cut lengthwise into quarters; stem and root base only covered with paraffin.	Orlando	4-6-33	2	0	1	3
	sandy loam			2	5	7
	Sand	4-6-33	1	0	1	4
Total			5	8	14	22
Grand Total			10	15	24	43

* Average bulb diameter 2.2cm; average leaf diameter 2.1cm., leaf length 14 inches.

The main objectives in further work are to determine the maximum number of increase which may be secured by the cuttage method, and also the most favorable season of the year in which to carry on the work under Florida conditions. As shown in Table 2, bulbs were cut lengthwise into fractions and these were again cut crosswise into fractions each with a portion of the stem and leaf scales. Table 2 shows that between December 5 to 14, five bulbs were cut into 32 fractions, and the same number each into 96 fractions.

Table 2. Vegetative propagation of Hybrid Amaryllis; Nehrling-Mead Strain; Cuttage in fall, 1933.

Treatment	No. of bulbs	Date set up	Total No. of Divisions	Number of Sprouts 12-15-33
Check A; cut lengthwise into 1/4's to root base.	1	11-12-33	4	0
Check B; cut lengthwise into quarters.	1	11-12-33	4	4
Cut lengthwise into 1/16's and cross-wise into 1/2's.	5	11- 5-33	32*	0
		11-12-33	32	0
		11-14-33	32	0
		11-14-33	32	1
		11-14-33	32*	0
Cut lengthwise into 1/16's and cross-wise into 1/6's.	5	11-12-33	96	0
		11-12-33	96	0
		11-12-33	96	0
		11-14-33	96*	0
		11-14-33	96	0

* Bulb had relatively small stem.

As check treatments one bulb was partially quartered to the root base and one bulb was quartered lengthwise. The fractions were planted in a propagating medium of half sphagnum peat and half sand contained in 18 x 24 x 4 inch cypress flats. A similar experiment will be set up in the spring of 1934. The results from both the fall and spring trials will be reported in a future paper.

A small number of trials with propagation by cuttage in other genera of the Amarylleae have also been made as shown in Table 3.

Table 3. Vegetative propagation of Amarylleae; Cuttage in fall 1933.

Genus and Species or Variety	Treatment	No. of bulbs	Date set up	Total No. of Divisions	Number of Sprouts		
					9-29-33	10-29-33	12-15-33
Crinum fimbriatum	Cut length- wise into $\frac{1}{4}$'s	1	8-25-33*	4	2	3	8
Hymenocallis caribaea	Cut length- wise into $\frac{1}{4}$'s	1	8-25-33	4	1	3	3
Narcissus	Cut length- wise into $\frac{1}{4}$'s	1	11-21-33	4	-	-	4**
Grand Soleil	Cut length- wise into $\frac{1}{8}$'s	1	11-21-33	8	-	-	5#
d'Or	Cut length- wise into $\frac{1}{8}$'s and crosswise into $\frac{1}{2}$'s.	1	11-21-33	16	-	-	3**

*One section flowered soon after planting.

** Fractional leaves have elongated.

In 4 fractional leaves have elongated; in 1 a strong new shoot has developed with whole leaves.

In the case of *Crinum* and *Hymenocallis* the response was quite rapid. These attempts will be expanded considerably during the present year.

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PROPAGATION OF AMARYLLIS BY SEEDS IN CALIFORNIA

RICHARD DIENER, *California*

The seeds are planted in flats with sandy leaf mold soil about three inches deep. The seeds are covered just enough to hold them down, and are usually up in three to four weeks. Afterwards they are transplanted into boxes two inches apart and when about six months old are planted in the lath house. Many plants start flowering when from fifteen to eighteen months old, depending on the strain.

VEGETATIVE PROPAGATION OF AMARYLLIS

I. W. HEATON, *Florida*

The practice of vegetative propagation of Amaryllis is frowned on by the commercial grower as a rule. He takes the stand that as long as the trade will take seedlings,—why bother. However, it is worth while to consider the other side of the question. The main drawback to the more general use of the amaryllis as a forcing flower by the florist is the fact that it does not bloom evenly,—one bulb blooming in January and another in July. This can be regulated to a degree by root-binding in a pot and resting, but this takes time—more time and space than the florist feels he can give.

The selection of stock for vegetative propagation requires much more attention to detail than seed stock as a whole. Generally speaking, the bulbs of the *Leopoldi Type* hybrids are shy on eyes or offshoots. The rate of growth in vegetative propagation is even more important than in seedlings for a year's difference in growth may mean four years in reaching a commercial supply of bulbs. In the method which we use, dependance is placed upon the eyes which would form offshoots as they became exposed on the basal ring. If the bulb does not have these eyes and there is no way of telling—even the microscope does not show them—rapid multiplication is impossible.

Bulbs for propagation should be selected when in bloom; mark each bulb by number, giving age, size, number of offshoots and a description of color, shade, etc. If the bulb has produced a crop of seed it will be ready to cut 30 days after the flower scape has dried.

The sprouting medium used consists of one-half each sharp coarse sand and German peat, well mixed. A 20 x 30 flat will hold divisions from 6 to 7 bulbs. Wash the bulb; trim the roots to $\frac{1}{4}$ inch and cut off the neck. Split the bulbs from top to bottom parallel with the leaf and cut each piece in half. Now you have four quarters. With the point of a sharp knife gently loosen three layers of scales from inside or center of each quarter, cutting down and inward to sever the solid base attached to each piece, 4 divisions. Now peel off two-layer pieces, 4 divisions. Then cut the remaining portion of the quarters in halves and remove three three-layer pieces from each (24 divisions). The basal sections, if the bulb is a large one, may each be split into halves (16 divisions). This makes a total of 48 divisions.

The pieces are placed in rows with the sand and peat covering all but $\frac{1}{2}$ inch of the top. Watering must be carefully done, as an excess will rot the fractions. In six weeks a small white shoot will be seen forming between the scales at the junction of the base. When this shoot comes above the surface it will have the appearance of a three months old leaf. In February or March these shoots are ready to transplant and the treatment is the same as for transplanted seedlings.

If proper care is used every eye will become a plant. Do not be disappointed if only 6 or 8 shoots appear. Any bulb which has a rapid growth and the inherent characteristics to form eyes, together with a good bloom, is worth \$1,000.00 to any commercial grower.

In August 1930 we cut two bulbs without knowing the rate of growth. One a dark wine color, blooming in December every year—a beauty. This bulb cut to 36 pieces, sprouted 18, yet today none of them are larger than $1\frac{1}{2}$ inches. The next one a good dark red, produced forty 3-inch bulbs which all bloomed last Spring, and have been cut again, making a stock of over 1200, which will bloom in the spring of 1935—one bulb a failure, another a grand success. Of four additional varieties, a large white one with faint pink markings, shows commercial possibilities from the standpoint of rapid vegetative propagation capacity.

From the florists viewpoint vegetative propagation is the best method to secure uniform blooms, and there is a great need for uniformity and standardizing. One good rapidly propagating variety will make a fortune for any man. The commercial grower has not the time and patience required to secure this result and looks to the amateurs to produce the standard stock.

6. Amaryllleae Culture

Regional Adaptation, Soils, Fertilization, Irrigation, Disease and Insect Control, etc.

SUCCESSIONS AND FAILURES WITH AMARYLLEAE IN MISSOURI

AL. G. ULRICH, *Missouri*.

The writer's experience with Amaryllleae covers a period of over thirty-five years. During that time he has grown and tried to grow some species in each of the sixty one genera of this interesting family of plants. His successes have about equaled the failures. Here in Missouri there is a great deal to contend with, especially in the way of climate. In summer the conditions are ideal, very hot with good showers now and then and, if they fail, our water supply is sufficient to apply every day. It is necessary, in the spring of the year, to locate the bulbs in a favorable position, some requiring shade and others full sun. Some are planted out in beds, dug up in the fall and dried off completely, while others must be kept evergreen. This means a great deal of work. At the approach of cold weather these bulbs must be taken indoors, either in the conservatory or a situation suitable for their resting period.



HIPPEASTRUM ADVENUM



VALLOTA PURPUREA

You who grow these bulbs in the South can hardly imagine the amount of labor and time required to do this work. All bulbs must be properly labeled and care exercised not to mix them.

Years ago when it was possible to import bulbs of all kinds, the writer's collection consisted of a great many species of *Hippeastrum* such as *H. rutilum*, *H. aulicum*, *H. psittacinum*, *H. reginae*, *H. equestre*, *H. leopoldi*, *H. pardinum*, *H. reticulatum*, *H. solandriflorum* and *H. vittatum*. Owing to the different latitudes, altitudes and situations in which these species grow there is quite a difference as to their cultural requirements. With the exception of *H. rutilum*, *H. aulicum*, *H. solandriflorum* and *H. equestre*, our conditions were not suitable. In a few years the other species were lost. In the meantime, however, the writer succeeded in using them as the foundation for his hybrids. His collection at the present time is not as representative as formerly, owing to lack of space. As with other collectors, his trouble probably arises from always adding new subjects.

Hybrid *Hippeastrums* require small pots. If they are pot bound they are almost sure to bloom. Be sure to have the drainage perfect for this is essential to the health of the bulb. Do not disturb the roots any more than is necessary. In repot-

ting use one size larger pot and a compost of sod soil, some sand and a good portion of rotted cow manure. The potted plants should be plunged in the soil in a semi-shaded place. The leaves are formed in the spring and continue to grow more or less throughout the summer. It is absolutely necessary that the growth be as thriving as possible in order to obtain flowers in the spring. In fall the plants should be taken indoors and rested. Early in the spring, if the summer growth has been good, the flower bud appears, sometimes before the leaves and sometimes with the leaves. In the crossing of species, the hybrid *Hippeastrum* has, in many cases, become almost leafless and it is rather difficult to know which to dry off and which to keep evergreen. Those which have a tendency to remain evergreen should be given water sparingly during their resting period, just enough to keep the leaves from drooping. All *Hippeastrums* should receive a fair amount of water during their growing period. Be careful to apply the water directly to the soil. A disease called "Red-rust," easily recognized by red streaks and spots on the leaves, is often caused by wetting the center of the leaves. Toward fall, when growth has been completed, less water should be given. After the leaves have turned yellow, the bulbs should be stored in a dry place at a temperature of about 50 degrees Fahrenheit, care being taken not to disturb the roots. This applies to varieties that have a tendency to dry off.

In large collections, thrips and mealy bugs sometimes prove very troublesome. Spraying with a tobacco solution (Black Leaf 40) or fumigating, will control thrips. Mealy bugs are rather hard to exterminate. A solution of equal parts of water and denatured alcohol, applied with a long brush, directly on the pests is about as effective as anything. They have a way of protecting themselves with a cottony web and spraying with tobacco has no effect on them. Liquid manure, about every two weeks, is beneficial to growth.

The narrow leaved, small flowered sections of *Hippeastrums* such as *H. advenum* and *H. roseum* are hardy in my garden, with protection. They multiply rapidly and are very effective in large clumps. This section blooms in the fall and then makes leaf growth. In the spring, after protection has been removed, they make another leaf growth. Then they die down in August, before flowering.

Next in importance are the *Crinums*, of which the writer's collection is very extensive. *C. amabile*, *C. pedunculatum*, *C. asiaticum*, and *C. giganteum* must be kept evergreen in the conservatory after blooming during the winter. *Crinum americanum* is hard to manage in pots. It multiplies by means of underground runners or stolons forming near the bulbs but often two or more feet from the parent bulbs. This method of propagation and conditions under which they grow in their native habitat is probably the cause of my failure with them.

Crinum longiflorum, both pink and white, are hardy in St. Louis. One should protect them with ashes. *Crinum powellii* and its varieties are also hardy. *Crinum scabrum* and *C. zeylanicum* must be dried off in the fall with just enough water to keep them plump in a warm atmosphere, about 60 degrees Fahrenheit. *Crinum yemense* and *C. abyssinicum* can be dried off entirely. The writer has used these two extensively in hybridising. *Crinum moorei* is one of the most satisfactory *Crinums* to grow. Use good sized pots with a soil mixture of two thirds rotted sod soil and one third cow manure. They can be rested in their pots and kept perfectly dry. Such *Crinums* as *C. pratense*, *C. lineare* and *C. kirkii* require pot culture and must be kept evergreen in winter.

This does not constitute the extent of the *Crinum* collection. A great many of the writer's own hybrids, some from other hybridizers, and also quite a few rare species, make the collection a very representative one. Sometime the writer hopes to discuss *Crinums* more fully. His notes, covering a period of over twenty five years, are very interesting and include entries on various phases of culture, habitat, date of introduction, successes and failures, hybrids raised and their parentage.

Next in importance in the collection are *Hymenocallis*, commonly called Spider or Spirit Lilies. This class of plants lends itself readily to culture. *Hymenocallis calathina*, *H. amancaes*, *H. concinna*, *H. harrisiana* and a number of hybrids, are easily grown. Planting out after danger of frost, encouraging their growth in summer, ripening them off in the fall and keeping them dry throughout the winter, will insure plenty of flowers in the summer. *Hymenocallis caribaea*, *H. littoralis* and *H. macrostephana* must be grown in pots and kept evergreen throughout the winter. The latter is one of the most beautiful of the species. The writer also has quite a few raised from seed obtained from a collector in Mexico. He hopes someday to be able to identify them.

Zephyranthes, or Wind Flowers, are charming. The flowers of most species are small and a large number in a pot in full bloom is a sight never-to-be-forgotten. The only species successfully grown in beds and dried off in fall is *Zephyranthes carinata*. The other *Zephyranthes*, such as *Z. candida*, *Z. rosea*, *Z. atamasco*, *Z. treatiae*, and *Z. texana*, must be grown in pots and kept in a growing condition throughout the winter. At one time *Z. erubescens*, *Z. verecunda*, *Z. lindleyana* and *Z. longifolia*, were grown by the writer but at present these interesting species are not members of his collection, but he hopes someday to acquire them again.

The *Pancratiums*, such as *P. illyricum* and *P. maritimum* are hardy here with protection. *Pancratium canariense*, *P. parviflorum*, *P. zeylanicum* and *P. sickenbergii* were rather hard to manage. They did not survive under St. Louis conditions.

Amaryllis belladonna and its varieties can be grown at the foot of a south wall or in cold frames where frost can be excluded. When planted in the open, fall rains induce leaf growth and later, the leaves are damaged by a freeze. In frames, weather conditions can be regulated so as to promote an uninterrupted growth of foliage during the winter months. This is an essential in bringing this bulb into flower. The flower scape appears in September before the leaves.

Vallota purpurea, Scarborough Lily, is an excellent plant for pot culture. The foliage is evergreen and the plant must be wintered in a frost free, well ventilated place. It resents repotting. Allow offsets to remain until you have a pot full of bulbs. The writer has had as many as eight scapes of blooms from one pot, which presented a wonderful sight.

Sprekelia formosissima, Jacobean Lily, a native of Mexico, is an old garden favorite, interesting and worth growing. Flowers are brilliant crimson, attractive and oddly formed. Plant the bulbs in the open in the spring and encourage growth during the summer. In the fall, after the foliage has ripened, dig and store them in a cool, dry place. They can be kept perfectly dry during their resting period.

Chlidanthus fragrans from the Andes of Peru, produces pretty yellow flowers. However, the bulbs increase so rapidly by splitting and offsets that it is difficult to keep them of a size to flower. Their constitution is very much like that of the tender narcissi. The bulbs should be planted in the garden in fertile loam in summer and at the approach of winter should be taken up without disturbing the roots, placed in dry sandy soil and kept in a dry situation in a temperature of about 60 degrees Fahrenheit.

Lycoris squamigera, from Japan, puts forth leaves in early spring, matures in June and blooms in August without leaves. The flower scape appears suddenly and in a few days attains a height of from two to two and a half feet. The flowers are rose lilac in color, fragrant and four to seven in an umbel. A large clump of this species in bloom is a wonderful sight. It is absolutely necessary that the leaf growth should be perfect or there will not be any flowers in August. They require at least two years to become established. The shock of transplanting and the lack of roots on the bulb tends to weaken the growth the first year. *Lycoris aurea*, *L. sanguinea* and *L. radiata* are tender here. At present they are missing in the collection.

The *Clivias*, from South Africa, make excellent house plants. The foliage is attractive and evergreen. The showy, red-yellow flowers are borne in umbels. The plants require considerable water when growing but during their resting period they should be kept in a temperature of about 50 degrees F. and receive just enough water to keep the leaves in health. *Clivia miniata*, *C. nobilis*, *C. cyrtanthiflorum* (*C. miniata* x *C. nobilis*) are the best and most easily managed and *C. speciosa*, *C. gardneri*, and *C. lindeni* are rather difficult to grow.

COMMERCIAL PRODUCTION OF AMARYLLIS IN FLORIDA

I. W. HEATON, *Florida*

After four years effort in raising 10 Acres of Hybrid Amaryllis we feel we have mastered the cultural problems in regard to types of soil, cultivation methods and fertilizing. We will briefly cover the salient points which we have discovered to be essential:

Seed

The first problem is good seed. It is difficult to purchase good seed in the United States, a broad statement, but from a commercial standpoint, a true one for the commercial Amaryllis is a hybrid, a combination of several species which have different inherent characteristics. The selection of seed stock is of the utmost importance. In our seed bed are no bulbs which did not reach the size of 3 inches in 2 years from seed. This we will call rate of growth, or vitality and which we rank as of first importance.

Large bulbs in a short time is our aim for the market is each year demanding larger sizes. A point in which they are mistaken. An old 2½" bulb will produce as much bloom as a 5" bulb, but the buyers will pay more for large sizes, so we must breed them.

Type of Bloom

Our experience shows us plainly that the large open face, well formed *Leopoldi* type is generally desired. The shape must be perfect, texture velvety and the color clean and true to base of throat. Extremely large size is not essential, 7 to 9 inches across the face of the bloom is enough. The lower petal must be as wide as the others—making a perfect triangle at the intersection of each set of three petals. The bulb must have produced at least 3 offshoots in the 2 years, showing the ability to form eyes for vegetative propagation.

Seed from bulbs fulfilling this description are difficult to obtain. Our seed stock is grown in a half shade slat house. We find the production of seed to increase nearly 50 per cent under shade, also less damage from natural causes to seed stock bloom.

Seed Beds

For two years we used standard celery seed beds, 1000 seed to 8 feet of bed, planted in rows 6 inches apart. Even when treated with standard formaldehyde solution the red root fungus caused enormous damage,—56,000 seedlings one year. There is no chemical cure for this fungus. After two years' experimenting, using every known method, we accidentally discovered a simple preventative. Changing our entire methods, we adopted the florist 20x30x4 inch cypress flat painted with crank-case oil. In this flat we use a soil mixture of rotted oak leaves, German peat, and local muck, screened and steam sterilized. The soil is then tested for acidity and enough hardwood ashes added to bring the pH reading to 6.80. No fertilizer is used before planting. Twenty rows of fifty seed are planted in each flat. The soil is covered with muslin, with a piece of glass fitting closely over the top. With this covering and the soil moist no additional water is required until the seedlings are up. The glass and muslin are removed as soon as the seedlings break through the soil—about 7 to 9 days in Florida. When 30 days old the first fertilizer is added. Three table spoonsful of calcium nitrate to 5 gallons of water is applied with a sprinkling can and washed in. Five gallons will suffice for 10 flats. The calcium will offset any carbonic acid formed since planting, and the nitrate gives the plants the needed push. A week later this is followed with an application of Nitro Phoska No. 3, a teaspoon to each flat, and this is continued every 10 days. No nitrate of soda or any organic fertilizer is used.

If planted in May and early June, by February the seedlings are ready for the field. They then will be ½ to ¾ inches in bulb diameter with leaves 10 to 14 inches long.

The land we use is flat-woods with the hard pan within two feet of the top of the soil but is well drained by tiling. The pH of the soil should be near 6.80. The seedlings are planted in rows two feet apart and 8 inches in the row.

As soon as growth starts a fertilizer mixture is added at the rate of 500 pounds per acre:

- 50 lbs. Calcium Nitrate
- 100 lbs. 10 percent tankage
- 50 lbs. Goat manure
- 50 lbs. Castor Pomace
- 200 lbs. 18 percent Phosphoric Acid
- 50 lbs. Sulphate of Potash.

We use no Sulphate of Ammonia on Amaryllis.

The more plowing with hand tools that is given, the better. The soil should be worked to the bulb rows. The bulbs are fertilized again in March and a drill of *Crotalaria* is planted between each row. Plowing is continued until July when the first cutting of *Crotalaria* is made. The *Crotalaria* is cut to one foot of the ground, and the cuttings are allowed to remain as a mulch. This early cutting makes some of the cover crop available quickly, at the same time mulching the soil and reducing the soil temperature. In September the *Crotalaria* is cut again and fertilizer is applied. In November the *Crotalaria* is pulled out and piled in rows between every fourth or fifth row of bulbs. At this time fertilizer is again applied and the ground cultivated. By January the *Crotalaria* stalks are chopped up with a hoe and scattered back over the field, where several cultivations will turn them under ground.

The more cultivation that is given between November and June the better for this will induce increased growth of the bulbs. The last fertilizer application is made in May and *Crotalaria* is again planted. Under this system of culture fifty percent of your bulbs should reach 2½ inches in diameter and up by November in the second year. An application of 1000 pounds of hardwood ashes after the summer rains will be found very beneficial.

AMARYLLEAE CULTURE IN EAST FLORIDA

MRS. EDITH FLETCHER CHURCHWELL, *Florida*

The various species of the Amaryllis family comprise some of the most valuable possessions of our gardens in East Florida. Almost every month of the year we can have blossoms from some member of this family. There are so few true lilies that we can grow successfully, and we turn to this group which is closely allied to the lilies. We find that they thrive much better in our climate and soil, and flower very freely.

The *Hippeastrum* group includes the *H. equestre* or Orange Amaryllis; *Johnsoni* (Johnson, 1810) and the many large flowered hybrids, which have a wonderful range of color. *Johnsoni* grows especially well with us and is usually blooming at Easter time. The hybrids commence to bloom in March and continue for a month or so. I fertilize my *Hippeastrums* immediately after blooming with a balanced bulb fertilizer. In the autumn I mulch them with half-rotted leaves, cow manure, bone meal and wood ashes. After the buds are about two inches high, I give them a top dressing of bulb fertilizer. If they are to be moved, or offsets removed, I do this in October. When grown in pots, I also repot or renew soil at this time. Care must be taken, not to keep soil wet when first transplanted, as it causes the bulbs to rot. They like a sandy soil containing leaf mold and are gross feeders.

The Eucharist Lilies, *Eucharis grandiflora*, are mostly grown in pots in our section, however, I have a friend, Mrs. A. C. Knight, who has them naturalized at her doorway and at Christmas they present a beautiful sight. Gardeners here have not been very successful in growing *Amaryllis belladonna*.

The *Crinum*s thrive wonderfully with us. I have many varieties. My favorite is the *Crinum longifolium album*. Its glaucous green foliage and pure white flowers are very lovely and it is our earliest bloomer among the *Crinum*s. They are always in bloom at Easter, when our real Easter Lilies fail us. Another interesting *Crinum* is one which presents a gorgeous spectacle in June. This one is shaped like a tulip, pure white with black stamens, several blossoms clustered on one stem. It has a vanilla like fragrance and the blossoms are very fragile. It is known locally as the "Christopher Lily". It was introduced into Jacksonville many years ago by the Christopher family, and is said to be a South American bulb. It has to be established to bloom and doesn't like have its roots disturbed.

The *Zephyranthes*, or "Flowers of the West Wind," have a dainty and fragile beauty. They are also known as Fairy or Rain Lilies since the buds shove up suddenly in large numbers following rains. They are especially adapted for border planting or in edges of shrubbery borders and in the rock garden. They make the best effect when planted in masses. We have the native *Zephyranthes treatiae* growing in our flat woods and they appear in large numbers in the early Spring.

They have been transplanted successfully to our gardens. *Zephyranthes candida* is most commonly seen and blooms in October. It looks like the *Crocus*.

I have a white *Zephyranthes* with miniature flowers—even smaller than the *Z. rosea*—also a large flowered white, tinged lavender on outside. It is a sturdy grower, and seeds abundantly. These two varieties were sent by Dr. Small of the New York Botanical Gardens to Mrs. Didell of Jacksonville. Of the pink flowered sorts, *Zephyranthes rosea* is my favorite. Though small, its flowers are a bright vivid pink and when massed make a striking effect. These bloom in early August. *Zephyranthes carinata*, the largest flowered pink, comes into bloom in May and blooms intermittently all through summer. I have never known this variety to produce seed.

In September and early October, our garden beauty is enhanced by the *Nerines* and *Lycoris aurea*. *Nerine sarniensis* is the commonest variety. It is best to let bulbs remain undisturbed for years, in fact, until they are crowded. Immediately after flowering they should be fed, as the bloom for next year depends upon foliage development and ripening of bulbs. If they are to be transplanted, do so when foliage begins to die down. I have several hybrid *Nerines*, shading from dark red, vivid crimson, scarlet pink, and mauve. Many have a glistening lustre which in sunlight or electric light gives the appearance of being dusted with gold or silver. The cut spikes of the *Nerines* stay fresh for a long time and are very lovely for table decoration when combined with silvery *Artemisia* or Maiden Hair fern.

LYCORIS AUREA

MRS. ELIZABETH W. MACARTHUR, *Florida*



LYCORIS AUREA

Lycoris aurea is native to the Orient. Botanically, the genus *Lycoris* is placed next to *Hippeastrum* an American genus in which the seeds are numerous in the locule and usually flat while in *Lycoris* the seed are few in a locule and turgid. Horticulturally *Lycoris* is most nearly comparable to the *Nerine*, but the seeds of *Lycoris* are black while the seeds of *Nerine* are green. There is also quite a difference in formation of blooms with their conspicuous white filaments and yellow anthers and the sword like foliage of these two genera when closely compared. However, the flowering season and manner of blooming are similar.

The sword like leaves of variable silvery, glaucous green, spring up and grow luxuriantly for a few months after the bulbs stop blooming and make a very attractive border plant for Florida winter gardens. Then the summer rains and hot dry winds sweep away all trace of this spring growth until there is no sign of plant life to be seen. It is a wise gardener that marks the exact spot of these sleeping lilies.

In Florida, *Lycoris aurea* remains dormant until September when suddenly a bloom stalk shoots up nearly two feet and magically the buds unfold into a glorious cluster of bright yellow blossoms. A large clump of *Lycoris aurea* in full bloom is a compelling sight.

The bulbs should be transplanted in late spring after foliage dies down naturally, and even so, the shock of transplanting may delay the bulb from blooming until second year. This golden Spider Lily is temperamental, therefore, don't be discouraged should the bulb refuse to bloom the first year. You will rejoice in a finer bloom and an increase in bulbs the second year. *Lycoris* seems to be happier if let alone until clumps grow large enough to make division necessary.

Lycoris aurea does not produce fertile seeds abundantly. When they do set seeds, the flower scapes may be bent over into soil and the seeds will produce bulb-

lets without further effort on the part of the gardener, or the seeds may be sown in pots and the seedlings repotted as soon as they are large enough. Care should be taken to provide protection against grasshoppers and the inquisitiveness of squirrels.

Lycoris seem to be free from attacks of insects generally, however, they are very much enjoyed by lubber grasshoppers who may gnaw down many bud stalks during the night and early morning.

Lycoris aurea has been cultivated in American gardens for many years with increasing enthusiasm. Just when and how it was brought to St. Augustine, Florida, seems to be shrouded in mystery, but certainly the enchantment of four centuries of impressive historical background have endowed St. Augustine with an inheritance of age and charm unrivaled by any other city in America and make it a proper setting for this highly esteemed Golden Lily of the Orient. It is greatly cherished by the people of St. Augustine along with other plant treasures. The Spanish tradition and influence of beauty and romance still linger within the quaint, lovely walled-in gardens filled with rare plants and bulbs.

The old coquina houses with their beautiful arched doorways, the enclosed patios, bubbling fountains and long narrow streets continue to delight and interest beauty loving people from the four corners of the world.

St. Augustine seems to be the location of the first introduction of *Lycoris aurea* in Florida and has more of these rare bulbs than any other section of the state but how and when it was imported to St. Augustine remains unsolved at this writing.

In search of reliable information relative to *Lycoris aurea* in St. Augustine, Mrs. F. W. Kirkland, No. 7 Carrera Street, was interviewed by the writer. Mrs. Kirkland purchased her present home twenty-five years ago from the Flagler Hotel Properties, Inc., and after living in this home some time, Mrs. Kirkland discovered a great many *Lycoris aurea* bulbs blooming under the house. The botanical name she did not know at the time. Mrs. Kirkland gave freely of these lovely golden lilies to her friends and noted that they seemed to flourish in shade and that they procured their own sustenance from air and the shell-impregnated sandy soil.

The Flagler Hotel Properties, Inc., employed an expert horticulturist, the late Mr. Richard Dale of Cleveland, Ohio, to landscape the grounds of the Ponce de Leon Hotel, one of the most beautiful structures of its kind in the world, and it is supposed that Mr. Dale with his knowledge and love of rare bulbs and plants was responsible for these choice bulbs being brought to St. Augustine and this seems to be a plausible conclusion.

Fine old clumps of *Lycoris aurea* are growing in the charming walled-in garden of the oldest house on St. Francis Street.

Many natives of St. Augustine call these lilies the HURRICANE LILIES and just as the Seminole Indian heed the warning that the saw-grass (*Claudium effusum*) bloom foretells them of approaching storms, they, too, have faith in the gift of prophecy, these mystery lilies seem to hold in their hearts of gold and prepare for storms—no blooms means St. Augustine will be free from storms, if there are many blooms St. Augustine prepares for storms—Therefore the common name the HURRICANE LILY. The people of Nassau also hold this supposition of *Lycoris aurea* and it is known by the same name there.

TENDER AND HARDY AMARYLLEAE IN KENTUCKY

MRS. WILLIAM LYMAN CARTER, *Kentucky*

The frost tender Amaryllae in my plant collection are grown either in pots the year around or are planted like gladioli outdoors in summer and dug up and stored in a frost proof place in winter.

Several years ago when I began cultural experiments with the half hardy and hardy members of the Amaryllae, I was reminded of the warning received from the Editor of the Old Garden Magazine about 1917,—“I do not think you will be successful in growing the Munstead Wood strain of primroses developed by Miss Jekyll in your capricious, unconquerable climate”. Mr. Barron was referring to the sudden freezing, quickly rising of temperature, all within a few days, even hours, that we in Kentucky are subjected to.

The experiments with both the hardy Amaryllleae and primroses, I am glad to report, have been successful to a marked degree. The cultural requirements for the Amaryllleae are different than those of the hardy, semi-shade loving primroses, but both are definitely established in my garden. The half hardy, summer-flowering Amaryllleae need deep planting, a winter mounding of soil and good drainage. Our limestone soil is to their liking and the climatic conditions, in the Blue Grass Section of Kentucky, are conducive to their general health and profuse flower development.



AMARYLLIS BELLADONNA

TENDER AMARYLLEAE

Amaryllis belladonna. I planted my first bulb of *A. belladonna* one January of long ago in an ordinary six inch clay flower pot which was kept in a sunny window in the parlor, heated with an open grate fire. To-day I grow them in a window of the living-room, where the temperature ranges from 60 to 70 degrees F. during the winter.

The first week in May the pots are sunken in a flower bed outdoors. These are lifted the latter part of September and set on a bench in full sun in the flower garden. Water is gradually withheld and the foliage begins to dry and bulbs enter the dormant state. In the latter part of October the pots are put on a shelf in the cellar vegetable room with two windows to give light and air, and a closed door to keep out the heat from the furnace room. The temperature ranges from 38 to 40 degrees F. when it is zero outside, and around 48 to 58 degrees F. at other times

during the winter storage period from November to the middle of February.

A Christmas gift of one copious watering is given, and no further attention is bestowed until the middle of February when some of the top soil is removed and replaced with fresh. The pots are then brought to the living room and are well watered. Soon growth begins, and by March flower stalks push through the soil, and soon we enjoy superb, glowing blossoms of Belladonna Lily.

Amaryllis (Hippeastrum). I grow only the hybrid *Johnsoni* (Johnson, 1810). It is planted in the garden in full sunshine and is stored through the winter like gladioli and other tender summer flowering bulbs in boxes of equal parts of sand and dry loam.

Hymenocallis calathina. Last spring I experimented in an attempt to extend the flowering season of *H. calathina*. Five plantings were made at intervals of about two weeks from the first week in May to the end of June. All bulbs except the last planting flowered normally.

Zephyranthes—In pots I grow six species of *Zephyranthes* the year round,—*Z. atamasco*, *Z. treatiae*, *Z. rosea*, *Z. texana*, *Z. candida* and the hybrid variety, *Ajax*. The bulbs are rested during the winter months in the cellar, and the pots containing them are sunken in the rock garden during the summer. This procedure I find better than planting in the open and treating them like gladioli. The potting soil should consist of two parts loam, one part well rotted cow manure and one part sand and a generous sprinkling of charcoal. I have recently received *Z. robusta*, which for the present is treated like a summer flowering bulb of the gladiolus type.



HYMENOCALLIS CALATHINA

HARDY AMARYLLEAE

Crinum. At present I grow only the hybrids *Powellii Alba* and *Powellii Rosea*, which are outstanding not only for their beauty but for hardiness as well. I discarded *Crinum longifolium* some time ago to make room for another plant. However this was a poor exchange and I hope to restore the former to its place of honor.

Zephyranthes and Cooperia. I grow only one species of hardy *Zephyranthes* in the rock garden, *Z. carinata*. This has proven hardy for the past three years. A 25 foot border of this species has also flourished in a Lexington garden for the same period with only a protection of leaves in the winter. This species blooms more profusely over a longer period of time when planted in the open than in pot culture. The increase in offsets is beyond expectation.

A twenty-seven years quest for the Texas Rain Lily, *Cooperia drummondii* and *C. pedunculata*, was ended last year when I secured these species from Mr. Ramsey of Austin, Texas. Was I happy? Everyone who collects plants knows the answer.

Hymenocallis. Only two species of this Genus are known to be hardy here. An old garden in Grayson County has a Spider Lily bed planted forty years ago. A garden enthusiast in Lexington reports that he collected a *Hymenocallis* species in Western Kentucky which he now has overwintered for three years.

This season I am experimenting with *Hymenocallis caribaea*. Two bulbs are reposing under five inches of soil in the garden with another five inches of soil mounded over them for winter protection. What has spring in store for me?

Lycoris. Three species of *Lycoris*, *L. squamigera*, with lavender flowers, *L. purpurea* and *L. aurea*, have proven hardy in a garden twelve miles north of here.



STERNBERGIA LUTEA

Sternbergia. The yellow crocus-like blossoms of *S. lutea* appear in October, each bulb sending up several flowers. These have greater substance than crocus and last longer.

Galanthus. The giant snowdrop, *G. elwesii* in my opinion surpasses *G. nivalis*. They cheerfully announce spring by blooming the latter part of February in my garden.

Leucojum. The Spring Snowflake, *L. vernal*, has always been in my garden. It was transplanted from grandmother's to mother's and from her's to my garden forty years ago. About five seasons ago I planted some in the rock garden. They follow the Snowdrops, and are in the lead of a great ever changing promenade of blossoms which gladden the whole growing season in my flower garden.

ZEPHYRANTHES LONGIFOLIA

REX D. PEARCE, *New Jersey*

Zephyranthes longifolia comes from semi-arid regions of Arizona, New Mexico, and Texas and favors rather dry calcarious soils. The bulb is rather large for a *Zephyranthes* and ripens off completely and stores well. Seed germinates freely and quickly. However, the flowers, pale primrose in color, are rather small and fugitive, and it is likely the species will arouse more of a botanical than a horticultural interest, unless it should prove of value in breeding.

EUCHARIS AND CLIVIA CULTURE IN FLORIDA

WYNDHAM HAYWARD, *Florida*

Eucharis is the pot plant par excellence for the porch or the shady patio in Florida. The only species ordinarily seen in the state is *Eucharis grandiflora*, Planch., commonly known as the Amazon Lily, a native of Colombia, South America.

The bulbs are grown in pots or tubs of rich soil and are allowed to become pot-bound, as in this condition they flower more profusely. As this is written, in January, *Eucharis* are to be seen blooming on hundreds of steps and front porches throughout every city in peninsular Florida.

The bulbs propagate slowly by offsets and the clumps may be broken up and repotted every few years when they begin to crowd the container. The flower is crystal white, star-like, and borne on stems one to two feet long, with several blossoms to the umbel. They have a pleasant perfume, and somewhat resemble a giant narcissus in appearance.

The bulbs need good drainage in the pots, and should have an abundance of water during the growing season. The foliage is rich dark green in thrifty plants and altogether decorative, with broad oval leaves narrowing to a short, stocky petiole. Experiments are being made to try the possibility of naturalizing *Eucharis* in good soil.



EUCHARIS GRANDIFLORA



CLIVIA MINIATA

Clivia miniata, Regel, listed in some catalogues under the old generic name of *Imantophyllum*, is another aristocratic plant of the Amaryllis family, requiring similar treatment to that accorded *Eucharis*. It is not strictly speaking, a bulb, but has a bulb-like base from which spring the dark-green strap-like leaves, which closely resemble those of *Hippeastrum*, except that they are smaller, stiffer and darker in color. The plant has abundant thick white roots, and requires to be potted in rich soil with good drainage.

As in *Eucharis*, the best blooms are produced by pot-bound plants established for two or more years. It takes a year or so, for a *Clivia* to become well established after repotting. The plant is increased by planting seed and divisions, after overcrowding in the pot is apparent. In the latter case the plant is removed from the pot, the earth washed from the roots, and the divisions separated and repotted.

A clump of *Clivia* with several bloom stalks appearing at the same time is an imposing sight. The flowers are borne in clusters, at the end of a stalk, and are like a small amaryllis, and the color is red-yellow.

NOTES ON AMARYLLEAE CULTURE IN TENNESSEE

HUBERT F. FISHER, *Tennessee.*

Many of the bulbous plants included under Amaryllaeae are freely used in the flower gardens of Tennessee. Those most commonly used both as house plants and in gardens are *Hippeastrums* and *Amaryllis belladonna*. When grown outdoors they are usually given for the winter months a cover of leaves and soil, or soil alone, for we sometimes have zero weather.

In planting these bulbs the holes are dug 14 to 18 inches deep and these are filled with a mixture of rich earth, bone meal and coarse sand. The bulbs are then mulched with rotted manure. The best method is to plant so that the neck of the bulb will be even with the surface of the soil. Many of the new hybrid amaryllis with their enormous highly colored blooms grow out doors if given careful protection.

About six varieties of *Crinum* are grown to a considerable extent. They are given much the same culture as amaryllis. In several towns in this section there is a most liberal use of *Crinums*. In gardens frequently they are seen in the sidewalk strips.

Two different types of *Hymenocallis* are native in this section. They grow easily in gardens.

Zephyranthes,—the large pink, *Z. carinata*; white, *Z. atamasco*, and *Z. candida*, are popular bulbs. They are planted about two inches deep and it is best to give them a covering of rotted manure and oak leaves for the winter. The large pink, *Z. carinata*, is the most desirable. It is used in pots, boxes and small tubs where it soon is crowded and then blooms best. It seems to like a slightly acid or neutral soil.

Nerine Sarniensis, Guernsey Lily, is seen in many gardens and in some in great numbers. They refuse to bloom well for gardeners who plant them too deeply or separate them nearly every year. Fertilizer is given them, either bone meal or rotted manure, when the leaves begin to sprout.

A favorite bulb is *Lycoris squamigera*, sometimes called Hall's Amaryllis and Magic Lily. *Lycoris*, like *Amaryllis belladonna*, *Nerines* and other similar bulbs bloom before foliage appears which makes necessary a precaution to protect them prior to the blooming season. There are four or five varieties of *Lycoris* but I have grown only *L. squamigera*, *L. aurea* and *L. radiata*. The bulbs should be planted like amaryllis, but fertilized like *Nerines* when the leaves appear. It is more certain to have blooms if the bulbs are planted shallow. In colder climates it may be necessary to plant the bulbs four inches deep. *Lycoris squamigera* is hardy over a wide section of our country into northern Ohio and New England. With no foliage in evidence, in July or early August, *L. squamigera* sprouts a long sword like scape 2½ to 3 feet with most unusual rapidity. There are frequently six to ten flowers of a beautiful light lavender tinted pink. In a nursery bulletin from England the blooms are described as a bright blue, light purple and bright pink. An interesting story about the growing of both *L. squamigera* and *L. aurea* in a cold climate is found in the *National Horticultural Magazine* for July, 1929. In the same magazine for July 1933, there is a beautiful picture of *L. squamigera* and a recommendation as to deep planting given by a distinguished Horticulturist.

Lycoris aurea is given the same culture as *L. squamigera* but its leaves appear just after it has flowered in the fall and unless protected, cold badly injures the foliage. If planted in a cold frame the foliage can mature and the bulbs are more certain to bloom. The blooms are of an unusual shade of golden yellow with a reddish tinge.

Even though Tennessee has severe weather at times, the Amaryllaeae are well represented in our gardens, adding greatly to their beauty, color and fragrance at intervals from April to October.

ZEPHYRANTHES CULTURE IN LOUISIANA

JAMES L. GEBERT, *Louisiana*

ZEPHYRANTHES CARINATA

Among the most interesting and beautiful members of the Amaryllis Family are the *Zephyranthes*. In different localities they are known under various names,—Zephyr Lily, Autumn Crocus, Fairy Lily, Fire Lily and Rain Lily. In the lower South these charming plants are often seen. They seem to be able to stand up better under abuse and neglect than any of the other Amaryllaceae. Neither heat, drought, excessive moisture nor poor soil apparently affect them very much. They will stand more abuse than most bulbous plants and at the same time give the greatest reward for care and attention.

Zephyranthes are natives of the tropics and subtropics. The range extends from the Argentine into the southern part of the United States. In Texas there are a number of native species and Florida has the Atamasco Lily, *Zephyranthes atamasco* and *Z. treatiae*. The Genus *Cooperia* is so closely related to the *Zephyranthes* that crosses between species from

the two have been made. It has been suggested by Worsley (1913, 1928) that these two Genera should be merged into one. In Texas the writer has seen *Cooperia drummondii* growing so abundantly that he could not put a foot down without crushing the dainty, perfumed flowers. The members of most species will lose their leaves during the dry season but with the first rains blooms will appear in such a short period that they come as a surprise, hence the name, Fairy Lily.

These bulbous plants are very easily raised as they can be propagated either from divisions or seeds. They may be transplanted at any season of the year and clumps of some of the species should be divided every year or so. When grown from seed they will bloom in about a year. The seed, however, should be planted as soon as mature for viability is very quickly lost. In sowing seed use a light porous soil, in boxes or pots with good drainage for the young seedlings cannot stand as much moisture as the mature plants. Transplant the seedlings into the open ground when they have three or four leaves. Some of the species, such as *Zephyranthes texana* multiply very slowly from offsets, but are very easily raised from seed, which is produced in abundance. *Zephyranthes candida*, the common white evergreen species, multiplies so rapidly from the mother bulbs that the clumps should be divided very often, in fact every year for the best results.

Zephyranthes should be planted close together so that they will make a mass of color and bloom. They are especially lovely in large groups of one kind in the rock garden. They should be planted among large plants for they will soon be lost. Planted by themselves they thrive and show off their delicate beauty to the best advantage. *Zephyranthes* can be planted either in sun or half shade. They bloom usually after a rain. During the dry season they remain dormant and lose their foliage in some cases. The common white species, *Z. candida*, is often used as a border plant. The leaves are evergreen and look well at all seasons.

The following are most generally met with and are considered by the writer the pick of all he has had any experience with. All of these are easily handled either in the open or indoors in pots or window boxes. The classification under Sub-genera is according to Baker, 1888. *Cooperia* is tentatively treated as a "Sub-genus" following the suggestion by Worsley (1913, 1928).

SUBGENUS ZEPHYRANTHES PROPER. Flower erect; tube short.
Stamens inserted near its throat.

[This section includes 18 species of which the following five are considered.]

Z. atamasco. A native of southeastern United States, especially Florida. It has a large, white flower and blooms in the early spring, occasionally also during mild winters. There are several varieties, differing in blooming season, color and also in the width of foliage.

Z. carinata. Flat, pink blossoms at various times through the spring and summer. One of the species which is most generally cultivated. It does not produce seed but multiplies rapidly from offsets. Very hardy. Native of Mexico.

Z. rosea. A small, rose colored species with crocus-shaped blossoms. It is a native of Cuba. With the writer in Southern Louisiana it is not as hardy as some of the others. A good seeder and multiplier by offsets.

Z. texana. A native of Texas and the western part of Louisiana. It is very hard to find in Louisiana because it grows in the tall grass. In parts of Texas, Brazos County, it is very abundant and easily found. The flowers are yellow on the inside and copper colored on the outside. It produces seed in abundance which are smaller than those of the other species mentioned.

Z. candida. This is the most widely known species. It is white in color and the blossoms appear in the late summer and fall. It has round, rush-like foliage which is evergreen. I find this species a poor seeder but a good multiplier by offsets. It is native to the Argentine.

SUBGENUS ZEPHYRITES (Herb.) Flowers slightly inclined; tube short.
Stamens inserted near its throat. Style more declinate
than in the two other Subgenera.

[This section includes eleven species, one of which is here considered. *Z. caerulea*, a pale blue flowered species from the Argentine, belongs in this section. this is being imported by the American Amaryllis Society.]

Z. robusta. Native of Buenos Aires. In color it is reminiscent of the orchid. The writer has two types of this species differing in the depth of the pink color. The deeper colored form is more vigorous and produces larger flowers. This species is a persistent bloomer and has promise as a cut flower since blooms have been kept in a living room for three days in good condition. It increases rapidly from seeds and offsets, and is very hardy.

SUBGENUS PYROLIRION (Herb.) Flowers erect; tube longer, dilated in upper half. Stamens inserted at middle of the perianth tube.

[This section includes five species, one of which is here considered.]

Z. aurea. Golden yellow in color. A slow multiplier by offsets. It produces seed, however, in abundance. Native of Peru.

"SUBGENUS COOPERIA" (Worsley); Flower tube relatively long; anthers erect as contrasted with tube shorter; anthers dorsified, versatile
in the preceding three subgenera.

[This section includes two species, both of which are here considered.]

"C. drummondii"; a native of Texas, New Mexico, and North Mexico. Very tall blossoming stem but the flower is not as large as *C. pedunculata*. It seems to be a late summer and fall bloomer following the rains that come after the summer drought. Alternate drying and wetting usually results in flowers anytime from early June to first fall frosts.

"C. pedunculata". A native of Texas and Western Louisiana. Very fragrant, solitary, white flowers about two inches across. Flowers open only in the late evening and the next day or so, depending on the weather, they turn gradually to

a pinkish color. Blooms after rains and is sometimes called Rain Lily for that reason. Plant multiplies very rapidly from seed and bulbs.

HYBRID ZEPHYRANTHES

Ajax (....., 18....) This is a cross between *Z. aurea* and *Z. candida*, and the writer considers it the finest of the whole group. It has round, rush-like foliage and straw colored blossoms. A very free bloomer and rapid multiplier.

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CRINUMS IN THE SOUTHEAST

WYNDHAM HAYWARD, *Florida*



HYBRID CRINUM—CECIL HOUDYSHELE

The Crinum Lily, in its many species and varieties, is one of the most popular ornamental bulbous plants of the Amaryllis family found in dooryards over the Southeastern states, particularly the lower South, along the Gulf Coast and in Peninsular Florida. Most *Crinums* are not particularly hardy, although *C. longifolium* is reputed to be able to withstand the cold as far north as Washington, D. C.

The bulbs, many of which are very large at maturity, are usually grown with little care or cultivation, and show a remarkable power of multiplication and survival even under the most unfavorable circumstances.

The plants are commonly known as "Milk and Wine Lilies", and sometimes may be seen in rows of hundreds around the older houses in sub-tropical regions. When well cared for, the varying types of foliage are interesting and handsome, and the flowers ranging from pure white to

deep rose-purple, with many intermediate stripings and shades, are attractive and striking.

Apparently a very few species comprise the list of dooryard *Crinums*. These are usually of the less attractive species. When some of the new hybrid *Crinums* become better known, the plant will undoubtedly attain increased popularity among discriminating people. The common types may then be disregarded as too ordinary.

The common practice is to plant a *Crinum* bulb by merely digging a hole for it, in poor ground or rich, with the result that it grows and flowers, in spite of all difficulties, and produces a clump of the bulbs in a few years by the formation of offsets. When the clump begins to be crowded, the bulbs are divided and planted farther apart. With adequate fertilizer and moisture, the *Crinum* succeeds in becoming a more handsome plant than the specimens ordinarily seen.

Large clumps of some varieties may send up a number of bloom stalks at the same time, and *C. asiaticum*, for instance, under this treatment, may well be described as ever-blooming. *Crinum amabile*, with huge leaves and flower stalks, *C. longifolium*, the pink and white varieties, *C. fimbriatulum*, *C. giganteum*, *C. kirki*, *C. moorei*, *C. powellii*, *C. scabrum*, *C. virginicum*, *C. asiaticum* and *C. augustum* are among the species noted in the Southeast, and some of these are not as common as others. Among the hybrid varieties of note are *Ellen Bosanquet*, *Cecil Houdyshe*, *Peachblow*, *J. C. Harvey*, *Sophia Nehrling*, and *Mrs. Henry Nehrling*.

The late Henry Nehrling discusses nearly 30 kinds of *Crinums* in an article in the Standard Cyclopaedia of Horticulture, which he had at one time or another in his collection in Florida, and it is hoped that some of these may have passed to other hands and have thus been preserved. Mr. Theodore L. Mead of Oviedo also had an extensive collection of *Crinums* some years ago.

Some of the *Crinums* are popularly known as Tiger Lilies, or even Spider Lilies, in the case of *Crinum asiaticum*, which has a white flower with slender delicate petals. Most of the common Milk and Wine Lily type bloom in the warm season. A few varieties need support for their long bloom spikes to obtain best results.

One of the most chastely beautiful of the *Crinums* is native to this country, and should be in every collection of Southern plants for its simple elegance and delicate perfume. *Crinum americanum* is the only species native to the United States, and is found in marshy or swampy places along roadsides where it sends forth its white, star-like flower to delight the observant motorist. One needs a shovel to dig the bulbs, however, it may be said from sad experience, in order to get the entire plant, roots and all, out of the mud. Although found growing in wet places, it seems to adapt itself with ease to high land conditions.

THE AZTEC LILY, SPREKELIA FORMOSISSIMA

REX D. PEARCE, *New Jersey*



SPREKELIA FORMOSISSIMA

Sprekelia formosissima, known in the horticultural trade as *Amaryllis formosissima*, and officially designated, Aztec Lily, by the American Amaryllis Society, thrives very satisfactorily in the North as a summer-flowering garden bulb. Planted out as soon as the soil is warm and danger of hard freezes is past, it will begin flowering in the Philadelphia area by late May and will continue all through June, an occasional bloom being thrown even during July and August. The large velvety crimson blooms have much the form of fantastic fleur-de-lis, and grown in beds or border clumps the rich brilliance of its coloring will be appreciated. *Sprekelia* also cuts well and while I do not know that any fair trial has been made of its value for the purpose, in the way of commercial marketing, it has potentialities in this respect that are worthy of investigation.

As to cultural requirements, it is tolerant of varying soil conditions, but prefers high fertility. I have grown it successfully on drained peaty muck and on heavy clay, but it seems to prefer a medium light loam. In autumn the bulbs should be dug and the leaves removed above the neck of the bulb, but the roots left on. My own practice is to stack the crates containing the bulbs out of doors for a few days, letting the air draw through them until they are surface dried and the cut stems and broken

roots have seared. Then they are stored in a dry bulb cellar, maintained during the colder months at a temperature range of 45° to 50° F. So handled there are no storage losses.

Sprekelia naturally propagates through basal offsets. Any offsets that are well split from the parent bulb may be removed in the spring and lined out for further growth, but care should be taken not to force separation of offsets that are still closely attached.

If hand pollinated, *Sprekelia* will seed freely, and the seed, unlike that of *Hippeastrum*, retains its biability well into the second year. Sown in open ground seed beds when the weather is settled in the spring, it germinates quickly and strongly. Seedlings usually flower the third year. I have noticed some slight variation in seedlings; also mutations have appeared in stock propagated vegetatively. I have segregated a type with glaucous foliage and flowers of paler coloring, indeed almost a rose shade. Also I have segregations that show a much increased rate of offset production but seem identical in other characteristics with the regular stocks.

Sprekelia forces readily enough for early spring flowering, but one should not attempt to hurry it too much, and it is quite useless to pot the bulbs up until they have had a rest period of at least two months after digging.

The often repeated statement in books of reference that *Sprekelia* is a greenhouse bulb, or for outdoor planting in warm climates, has doubtless kept it from being more widely grown. Such statements are misleading. This bulb will thrive anywhere that *Gladioli* can be grown, and it may be handled and stored in very much the same manner. In growing it for more than fifteen years, under both Middle Western and Atlantic Coast climatic conditions, I have not found that it was subject to any diseases or insect pests.

CHLIDANTHUS FRAGRANS

REX D. PEARCE, *New Jersey*



CHLIDANTHUS FRAGRANS

Chlidanthus fragrans, a dainty little Argentina Amaryllid with sweetly perfumed trumpet-shaped flowers of deep golden yellow, may be easily grown as a garden bulb, North or South. By late May it is producing blooms and while the flowering season extends only for two or three weeks, the blossoms are most attractive. The bulbs store well in a cool dry cellar, but start into growth early and must be planted just as soon as the ground has stopped freezing a crust in the spring. Only well grown fairly large bulbs will flower, and it needs high fertility and ample moisture. It is hard to get the soil too rich. The bulbs make offsets profusely, and these should all be taken off before replanting, otherwise one will simply have clusters of bulbs too small to bloom. When one gets the knack of handling it so that a high percentage of flowering bulbs is produced, it is an altogether likeable plant.

HIPPEASTRUM EQUESTRE

REX D. PEARCE, *New Jersey*

Hippeastrum equestre is the one *Hippeastrum* species that seems capable of flowering freely under open garden conditions in the North, and the salmon orange blossoms are rather long lasting. The bulbs are not difficult to store in winter, nor to grow, although they tend to make an excessive quantity of offsets.

BELLADONNA LILY, NERINE AND CRINUM CULTURE IN ENGLAND

THE HON. HENRY D. McLAREN, *North Wales, Great Britain*

England is a country with a cool summer, and a substantial rainfall, and in many parts of it there is a stiffish soil which is retentive of moisture. England therefore as a whole is a bad country for the hardy *Amaryllidaceae*, which for the most part rejoice in hot sunshine and sharp drainage.

In the South and West however both the lovely Belladonna Lily, and *Nerine bowdeni*, do well, especially if planted at the foot of a South Wall; and the former is seen in many an old garden—very often growing in the border outside a greenhouse. In a very few gardens the better forms of the Belladonna Lily are grown. It is a variable plant and the one with a narrow petalled flower should be discarded in favour of that with a broad deep pink petal. There are bi-generic crosses or reputed crosses too with *Brunsvigia josephinae*—"Brunsdonnas" or *A. belladonna* "*parkeri*"—which are much superior to the parent; the best of them is the very scarce *A. belladonna parkeri alba*—a lovely thing recently honored with a First Class Certificate by the Royal Horticultural Society.

Nerines from South Africa are not generally fitted for outdoor culture in England. They want to grow in winter and to rest in summer, and the climate forbids this. *N. bowdeni* which starts later into growth and continues to grow in Summer is the exception and this is fairly often seen in the open. The other *Nerines*—much crossed and in shades from scarlet through pink to white—are frequently grown under glass. A cold frame will do unless the winter is very severe, but a cool house is better. They are easy to cultivate provided only that they are kept bone dry and in full sun from May to September. The late Mr. Henry Elwes was a great raiser of hybrid *Nerines* and had a fine collection, but perhaps the finest hybrids known are two named *Aurora* and *Hera* raised by a Mr. Rose near Oxford and bearing amazingly large umbels of flower. They are reputed to be hybrids of *N. bowdeni*.

Of the *Crinums*—another branch of the Family—the hardy species are very satisfactory for outdoor cultivation in England. Their foliage may be cut by winter frost, but if they are planted fairly deep they flourish in spite of it and flower freely. *Crinum longifolium* has a poor flower and is quite outclassed by the hybrid *Powellii*; especially in its white variety, *Powellii Alba*, and in the superior forms *Krelagei* and *Haarlemense*. There are of course many greenhouse and stove *Crinums*—fine things but taking much room for the quantity of flower they give, and they are only grown nowadays in a few gardens other than those devoted to botanical collections.

In one or two gardens there is grown that grand bi-generic hybrid raised by Mr. Fred Howard, of Los Angeles, California, known as "*Amarcrinum*," the progeny of *Amaryllis belladonna* and *Crinum moorei*. It is a free growing, free flowering, hardy plant whose blooms are far ahead of those of its parents—pink with a cream coloured centre, deliciously scented, twenty or thirty to a head—an absolutely first class plant.

THE RED LEAF SPOT OR "RUST" OF AMARYLLIS

DR. FREEMAN WEISS, *Pathologist*

BUREAU OF PLANT INDUSTRY, UNITED STATES DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C.

The presence of red spots and streaks on Amaryllis leaves is not symptomatic of a particular disease, but represents the characteristic response of this plant to several types of injury. Among the inciting causes diverse agents such as fungi, thrips and mites are known. Fungous parasites are usually visible to the eye only when they form their reproductive bodies (various types of spore aggregations), and even the insect and related pests that may cause red spotting of Amaryllis are not conspicuous,—often can not be found in close proximity to the spots. It is not surprising that only the symptoms and not the real cause of the injury attract the

eye of the grower, and that he has erroneously supposed that he had a simple and specific condition to deal with. Because the different agents that are capable of inducing this disease are not susceptible to any one type of control, it is essential that the Amaryllis grower learn to recognize the different kinds of red spot or rust disease, and to apply the appropriate control measures accordingly.

Fungous "red spot", "red burn", or "rust"

Several kinds of fungi have been reported in different countries to cause a disease of this type in Amaryllis. In 1929 three nearly simultaneous accounts of a new Amaryllis disease were published in Germany and in Holland, which was ascribed in each instance to a differently named fungus. One of these was considered identical with a fungus that had previously been described on a *Crinum* (Amaryllis family). At about the same time, a similar disease was reported to occur on cultivated Amaryllis in California, and the causal fungus in this case was shown to be identical with a parasitic fungus of which the earliest scientific record was a collection made on naturalized narcissus in the Carolinas nearly a century ago. Still another collection of apparently the same fungus, though again differently named, was made in Hungary in 1906. The confusion regarding the identity of these several collections has not yet been fully resolved, but it is now quite certain that the various fungi which have been associated with this disease of Amaryllis differ only in very minor details, if at all, and that the same fungus also causes a widespread, occasionally serious disease (leaf scorch) of narcissus. The proper botanical name of this fungus is *Stagonospora curtisii*. A probably identical fungus may also infect *Crinum*, *Zephyranthes* and *Nerine* of the Amaryllis family, and possibly *Lachenalia* of the lily family. Several species of *Crinum* and *Zephyranthes* are native to the southern United States ranging from Florida to Mexico. There is not sufficient evidence to show whether the fungus is also native to this region, but at any rate, it is known to occur on naturalized plants and escapes from cultivation of *Narcissus* and *Crinum* in the Southern States. The common occurrence of the fungus on naturalized plants is an important factor in control of the disease in cultivated narcissus and amaryllis.

On amaryllis plants the effects of this fungus are most familiar on the leaves and flower stems, where numerous small red or reddish brown spots appear. The spots are at first separate, and typically circular or elliptical in form, usually with an indistinct margin, and sometimes surrounded by a greenish brown halo. Later the spots increase in length, forming streaks and often coalescing. When a considerable part of the leaf surface is infected, or especially when the flower stem is attacked early in its development, the affected parts are more or less deformed and stunted and the flowers are crippled. The fruiting bodies of the fungus on amaryllis leaves are not conspicuous, and they are not formed until the leaf tissue is thoroughly invaded by the fungus and killed. These bodies consist of minute cushions of spores formed beneath the leaf epidermis and extruded through minute pores. The pustules do not have, as is the case with many leaf-spotting fungi, a color (usually black) that contrasts with the dead leaf tissue,—they are brown or reddish brown. In damp weather the spores may be seen emerging in minute tendril-like masses from inside the leaf, but these details can be satisfactorily made out only with a hand lens.

The fungus may also invade the bulb, especially the apical part of the outer scales. Rather large lesions are formed here, and the infected areas may be subsequently invaded by bulb mites which further enlarge them. Eventually the bulb may be rendered worthless for flowering, but this is not a typical effect of the fungus alone.

In the narcissus, control of the primary or bulb-borne phase of the leaf scorch disease has been accomplished by soaking the dormant bulbs in a strong disinfectant solution, e.g. in $\frac{1}{2}$ per cent formalin (1 pint to 12 gallons of water) or in 1/10 per cent mercury bichloride (1 ounce to $7\frac{1}{2}$ gallons of water) for at least 2 hours. It appears to be equally effective to soak the bulbs in water alone for about 2 hours, then in the respective fungicide for 30 minutes; this reduces the likelihood of any injury to root or shoot growth. Only a few experiments have been made with amaryllis bulbs, but the benefit of the formalin soak has been demonstrated in some instances, and there is no risk of serious plant injury even from treatments prolonged considerably beyond 2 hours. Control of the second phase of the disease in narcissus, that is, the spread of the fungus from plant to plant that occurs when

the leaves are wet, depends partly on the thoroughness with which bulb-borne infections are eliminated and on the absence or scarcity of naturalized plants which may serve as sources of infection. Control of this phase by spraying with bordeaux mixture (4:6:50 formula, with a resin sticker added to promote adhesion) or dusting with copper lime dust, has been shown possible, but is of doubtful practicability, because of the comparatively low value of narcissus bulbs. With amaryllis, spraying should be profitable but it must be begun with the first appearance of shoots and continued, at least during rainy weather, until leaf growth is complete.

Control

The measures by which fungus (*Stagonospora*) red spot may be controlled are summarized as follows:

1. Avoid planting sites for amaryllis bulb production that are near ornamental or naturalized plantings of any of the other hosts (narcissus, especially Paperwhites and Soleil d'Or, Amaryllis, Crinum, Zephyranthes and other members of the Amaryllis family).

2. Keep the plots (of seedlings and young plants) as free as possible from spotted and aged foliage by periodic picking over and at least one thorough annual cleaning.

3. In setting out bulbs for increase, segregate those that are known to have come from a previously diseased stock, or that show even slight scale lesions typical of this disease. Such bulbs should be treated with a disinfectant as indicated above, and had best be planted at some distance from the bulbs that appear wholly free from disease.

4. The practicability of spraying during the growing season has not yet been demonstrated, but it may be useful as a supplement to other control measures. Bordeaux mixture of the 4:6:50 formula (with hydrated lime, or 4:4:50 with quick lime) to which a resin sticker is added, is recommended for trial.

5. In indoor or greenhouse culture of amaryllis, a fair degree of control may be attained by watering the pots by subirrigation if practicable, or at least by avoiding wetting of the foliage. Excessive shade and a damp atmosphere are also to be shunned.

INSECT AND MITE ENEMIES OF AMARYLLIS AND THEIR CONTROL

DR. FLOYD F. SMITH, *Entomologist*,

BUREAU OF ENTOMOLOGY, U. S. DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

The amaryllis plant is subject to attack by a number of pests, including both insects and mites. Often, however, it is grown relatively free from attack. Little is known about some of the ills that beset these plants. For instance, reddish spots and streaks often appear on the leaves and the flower stems. This condition may be caused either by the feeding of red spiders, thrips, aphids, or mealybugs, or possibly by some disease. Besides foliage injury of this type, the flowers, bulbs, and roots may also be damaged. Several of the pests, such as red spiders, mites, thrips, and mealybugs, are general feeders and a knowledge of their habits is at hand through a study of these pests on other plants. An attempt has been made to set forth here the information that is available on the insect pests of amaryllis, and this information has been grouped according to the type of injury or the part of the plant fed upon.

Insects Causing Spotting of Leaves and Bulbs

Injuries to the surface layers of cells on the leaves and bulb scales, whether caused by feeding of insects with sucking mouth parts or mites, are usually followed by reddening of the areas attacked.

Thrips—In both greenhouse and field several species of thrips, including the thrips *Heliothrips femoralis* Reut. the greenhouse thrips (*H. haemorrhoidalis* Bouche), *H. cestri* Perg., and the gladiolus thrips (*Taeniothrips gladioli* M. & S.), feed on the leaves and flower stems by puncturing or rasping the surface cells and sucking up the juices. Adults of these thrips are slender-bodied insects one-sixteenth

inch or less in length and are light brown to nearly black; the larvae are orange to pale yellow. The gladiolus thrips, which is differentiated from the others by the cream-colored band across the middle, apparently feeds to only a slight extent on the foliage, but causes such severe injury to the bud and flower that the latter opens imperfectly.

The following insects puncture the tissue and suck out juices from beneath the surface: In the field one of the plant lice, the pink and green potato aphid (*Marcosiphum*) *Illinoia solanifolii* Ashm., is sometimes found on young leaves and buds. In the greenhouse the citrus mealybug (*Pseudococcus citri* Risso) and the grape mealybug (*P. maritimus* Ehrh.) are often found in cottony masees, particularly in the crevices between the leaf bases and on the bulbs. A third mealybug (*Trionymus lounsburyi* Brain) has been found on amaryllis from Pennsylvania. The hemispherical scale (*Saissetia hemisphaerica* Targ.), which is smooth, brown, and oval, and the soft scale (*Coccus hesperidum* L.), which is also brown but longer, are sometimes found on the foliage and on other parts of greenhouse-grown amaryllis.

Red spider mites.—The common red spider (*Tetranychus telarius* L.) and the two-spotted mite (*T. bimaculatus* Harvey) pierce the epidermis of the leaf and draw out the liquid contents of the cells. Areas so injured at first become pale, later turn rusty red, much as when injured by thrips. The color of the oval-shaped, eight-legged mites ranges from yellow to red; they are about one-fiftieth inch in length, and are usually found in large numbers. Their shining, round eggs are found on the under sides of the leaves, covered with protecting webs.

Another mite, known as *Tarsonemus hydrocephalus* Vitz., has been recently discovered to be injurious to amaryllis in certain greenhouses in Germany. The mites are white when young, but caramel-colored when adult. They are oval in shape and practically invisible without the aid of a magnifying lens. The mites feed in large numbers in the neck of the amaryllis bulb and injury becomes evident on the leaves and scape as these elongate. The flower buds may be crippled, the bulbs and roots may be injured and become reddened, or, when severely infested, the bulbs may disintegrate. This pest is not known to occur in America, but a related form is rather widespread on narcissus in this country, and may also attack amaryllis.

The bulb mite (*Rhizoglyphus hyacinthi* Bdv.) frequently occurs on many kinds of bulbs, including amaryllis. It causes injury by burrowing into the roots and stems, or works on the surface of the scales, causing reddish spots. Leaves of heavily infested plants become yellow and sickly and the flowers may fail to develop. Although bulb mites are capable of living on diseased bulbs, there is evidence to indicate that they prefer to feed on healthy tissue and that they disseminate the organisms causing decay. The mites are pearly white and, when working in the bulb, may be barely seen with the naked eye.

Insects Devouring Foliage and Flowers

In the southeastern part of the United States grasshoppers, particularly the eastern lubber grasshopper (*Romalea microptera* Beauv.), feed on the foliage and exposed bulbs of amaryllis.

Certain brownish or grayish, velvety-smooth caterpillars, belonging to the cutworm family feed on field-grown amaryllis. Among these the caterpillars of the *Spanish moth* (*Xanthopastis timais* Cram.) devour the foliage. This insect occurs from Maine to Brazil and is common in our Southeastern States. In Brazil a related form, *X* (*Glottula*) *heterocampa* Gn., is also a pest of amaryllis. In Australia and the Far East two other species of cutworm caterpillars, *Brithys crini* Fab. (*Glottula dominica* Cram.) and *Calogramma festiva* Don., cause considerable damage to leaves of amaryllis and lilies. In Germany the privet sphinx (*Sphinx ligustri* L.), a large, light-green caterpillar striped with violet and white and attaining a length of 4 inches, devours foliage of amaryllis and other plants.

The lean blister beetle (*Epicauta strigosa* Gyll.) feeds on amaryllis flowers in Florida. This insect, together with other related forms, injures many crops. Blister beetles have slender bodies and are black, or black striped with gray or dull yellow. They appear suddenly in large numbers in midsummer and, after causing severe damage for a short time, disappear just as quickly.

Insects Burrowing in the Bulbs

The narcissus bulb fly (*Merodon equestris* Fab.) has been known as a narcissus pest for nearly 200 years and as an amaryllis pest for over 35 years in Europe, Eng-

land, and North America. Bulbs are attacked both in the field and in the greenhouse. The larvae feed in the interior of the bulbs, only one or two larvae in each, and their presence is not readily detected unless the bulbs are handled, when they usually "give" to pressure of the hand, or the base is found to contain an entrance hole. Foliage of infested plants usually becomes sickly and the whole bulb may disintegrate. Usually the infestation is discovered in field stocks at digging or cleaning time or by the sickly appearance of plants when forced under glass. The legless maggots are dirty white or yellowish and about three-fourths inch long; the pupae are oblong, brownish capsules; and the adults are large, hairy, yellow and black flies superficially resembling bumblebees. Adults appear in the spring and lay eggs that hatch into larvae. These enter the bulbs and grow until the following spring. In Germany a related species of bulb fly (*Merodon clavipes* Fab.) is also a pest of Amaryllis and apparently causes similar types of injury.

The lesser bulb flies (*Eumerus spp.*) are apparently widespread in America and Europe. Their size approximates that of the housefly, and they are black with a metallic luster. The larvae are dirty white and considerably smaller than those of *Merodon equestris*. The larvae occur in large numbers in a single bulb. They seem to prefer weakened bulbs as food, whether weakened by the large bulb fly, nematodes, mites, or disease. Heavily infested bulbs usually disintegrate completely, but those containing only a few larvae may be detected only by pressure with the hands.

In Africa and Europe, large fleshy, whitish grubs of a weevil, *Brachycerus* sp., have been found hollowing out the interior of amaryllis and other bulbs.

Control

Control practices may be divided into two types—prevention of infestation and direct control.

Prevention—As many of the pests affecting amaryllis also attack other bulbous crops, the amaryllis plantings should be segregated as much as possible; also sites recently used for planting such crops should be avoided. Weeds serve as food for such pests as thrips, grasshoppers, cutworms, and red spiders, therefore the plantings and surrounding areas should be kept as weed-free as possible.

Direct control—Where pests have gained a foothold, the following treatments may be used for the pests named:

1. In greenhouses fumigation with calcium cyanide, using low dosages one-fourth ounce per 1,000 cubic feet for aphids, and higher dosages (one-half to three-fourths ounce) for mealybugs, scale insects, and thrips—is effective if repeated at weekly intervals. Fumigation with naphthalene will kill red spiders and thrips.

2. Through syringing with water will dislodge and kill large numbers of red spiders, thrips, and mealybugs, and may be the only treatment required for these pests. This practice may be inadvisable, however, where the problem involves disease control.

3. Where spraying is resorted to for control of the above pests either in the field or greenhouse, use $1\frac{1}{4}$ teaspoonfuls of nicotine sulphate and 2 tablespoonfuls of soap chips in 1 gallon of water. For more effective control of thrips a spray containing 1 tablespoonful of paris green and 2 pounds of brown sugar in 3 gallons of water has been used, but the possibility of injury to amaryllis where the material collects in the crown of the bulb has not been fully tested.

4. In small collections of plants it may be practical to control mealybugs by wetting them with a small brush dipped in a 70 percent solution of alcohol.

5. For control of blister beetles, protect the plants by covering them with cheesecloth, or dust them with a mixture consisting of equal parts of sodium fluosilicate and hydrated lime.

6. Grasshoppers and the leaf-eating cutworm caterpillars may be controlled by spraying with 3 teaspoonfuls of lead arsenate in 1 gallon of water, or with Bordeaux mixture, or by poisoning with bran bait. This bait is made up by mixing in one container 4 ounces of paris green and 5 pounds of dry bran, and in another 1 pint of molasses and 4 quarts of water. Slowly add the liquid to bran mixture as it is stirred. After this material has stood for several hours to allow the bran to take up the poison, scatter it sparingly among the amaryllis plants at sundown.

7. The bulb mites, tarsonemid mites, and bulb flies are killed by immersing the dormant infested bulbs in hot water for 1 hour at a temperature of 110 to $111\frac{1}{2}^{\circ}$ F. After treatment, the bulbs should be dried and planted in an isolated location to prevent reinfestation. Severely damaged bulbs should be burned to destroy the contained pests.

7. Curing, Storage and Forcing of Amaryllis Bulbs

CURING HYBRID AMARYLLIS

I. W. HEATON, *Florida*

Commercial amaryllis in Florida are generally dug in early November, although they may be lifted and cured at any time. A spading fork is the most satisfactory tool for hand work. The bulbs must be placed in the shade shortly after being dug as the hot sun will quickly burn through several layers of scales. Care must be taken to prevent mechanical injury with tool or bruising. Never leave freshly dug bulbs in boxes as they will sweat and heat quickly. Any tray will do for curing. We find a tray four by eight feet with one inch mesh chicken wire bottom and six inch legs the most satisfactory. This permits the maximum circulation of air around the bulbs. With foliage and offshoots attached the bulbs are spread six inches deep over the tray. Three to four weeks are required to properly cure bulbs. When dry trim the foliage only to the solid part of the neck; remove offshoots and trim the roots to one and one half inches of the base. The shrinkage during curing generally $\frac{1}{4}$ to $\frac{1}{2}$ inch, depends upon the condition of the bulb when dug.

RESEARCH ON THE FORCING OF AMARYLLIS BULBS

The Boyce Thompson Institute for Plant Research at Yonkers, New York, is undertaking preliminary experiments on the subject of forcing amaryllis bulbs. Under date of December 7 and 23, 1933, Dr. F. E. Denny writes that the extent of future work undertaken on this subject will depend upon the outcome of these preliminary experiments. Three methods of breaking dormancy will be tried in the first attempts,—(a) the use of vapors of ethylene chlorohydrin, (b) the use of warm temperatures, and (c) the use of cold temperatures.

—Ed.

FORCING HYBRID AMARYLLIS

I. W. HEATON, *Florida*

The physical characteristics of the Amaryllis bulb must be considered in determining a successful method of forcing. The relation of the flower sheath to the leaf growth cannot be overlooked.

Splitting the bulb from neck to base at 90 degrees to the axis of the leaf, reveals the physical formation of the bulb. On the base extending below the scales is the scar of last year's scape. Beginning at the outside, we find the old leaf scales, which constituted last year's leaf growth. Next toward the center is the scape from last spring's bloom, and the scales from the current leaf growth. Directly inside of the current leaf scales is the sheath containing the beginning of

the next season's bloom. Near the apex of the base will be found the leaf formation for next year's leaves, and at the apex a careful examination will show a small white knot, which will develop into the second year's bloom.

The cross section of the bulb shows a three year growth cycle, except for the extreme base we have an entirely new bulb every three years, growing from the center to the outside in that period. The normal formation being, the leaves with the bloom formed outside the current leaf growth,—i.e., one set of leaves and one bloom, generally 3 to 5 leaves on each side of the axis. From the foregoing two methods of forcing are evident. One consists of delaying blooming, or suspending the normal process of the bulb until wanted. This method will only produce bloom after the normal period. Blooming may also be delayed by the use of cold storage, but little is known regarding the correct temperature. We have held bulbs in our electric refrigerator at a temperature range from 38 to 45 degrees F. from February to July and had splendid bloom in four weeks from potting, at an average temperature above 80 degrees.

In a second method the semi-dormant period is reduced by drying out the bulb. We used the following method with good success and can produce bloom at any time by careful handling and timing. We potted several hundred bulbs in the late fall, with a good soil in six inch pots. After blooming in the spring, when the leaf growth was fully matured, the pots were laid on their sides under the bench and permitted to dry out thoroughly. This required about 75 days or 4 months from blooming time. In late July they were brought back on the bench, watered lightly until growth started, then fertilized heavily with liquid guano. Inside of two weeks the new bud could be felt at the neck above the bulb. Six weeks from benching over 80 percent were in full bloom. This process was repeated and the bulbs brought into bloom again in early February, three weeks ahead of the normal time in a cold frame. We found the *Vittatum* Type the most successful as they became dormant more quickly than the ever-green species, some of which never lost their foliage, during the rest period. The bloom will be produced at the expense of the bulb unless the bulb is root-bound. A supply of potted bulbs properly timed will produce a succession of bloom the year around. It is reasonable to assume in the north during the winter, the rest period could be greatly reduced. This method I understand was developed years ago by gardeners.

(Continued from page 69)

<i>C. americanum</i> . NY.	<i>Eucharis grandiflora</i> . B.	<i>H. pedalis</i> . NY.
<i>C. Powellii</i> . B.	<i>E. subedentata</i> . B.	<i>H. expansa</i> . NY.
<i>C. Ellen Bosanquet</i> . NY.	<i>E. punctata</i> . NY.	<i>H. caymansis</i> . NY.
<i>Amaryllis belladonna</i> . NY.	<i>Pancratium maritimum</i> . B.	<i>H. collieri</i> . NY.
<i>Crinodonna memoria corsii</i>	<i>Hymenocallis occidentalis</i> .	
(<i>Amarcrinum howardii</i>).	M.	
NY; M.	<i>H. calathina</i> . M; NY.	
<i>Nerine sarniensis</i> . B; NY.	<i>H. littoralis</i> . M.	
Pancratiae	<i>H. speciosa</i> . B; NY.	
<i>Urceolina microcrater</i> . M.	<i>H. harrisiana</i> . B.	

Alstroemerieae

<i>Alstromeria aurantiaca</i> . B.	<i>A. aurantiaca lutea</i> . B.	<i>A. chilensis</i> . B.
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8. Marketing of Amaryllleae

THE MARKETING OF AMARYLLIS BULBS

WALTER J. GUILLE, *New York*



HYBRID HIPPEASTRUM

Prior to June 30, 1919 when Quarantine 37 went into effect most of the amaryllis (*Hippeastrum*) and related bulbous plants used in this country were imported. From Bermuda came rather liberal yearly shipments of *Johnsoni* (Johnson, 1810) where this variety had long been grown and known there as the "Spice Lily." Bermuda also sent over a strain of *Hippeastrum vittatum* hybrids which varied little from the *Johnsoni* for red was the dominant color and was present in practically all the flowers. These Bermuda importations, at their peak, amounted to about 25,000 bulbs annually and from this same source came an approximate equal quantity of *Zephyranthes*. *Lycoris squamigera* bulbs were imported from Japan—I would say 5000 to 10,000 annually. At that time small quantities of greenhouse-grown hybrids were beginning to arrive from Robert P. Ker & Sons, and other of the European hybridizers. Together with a small constant supply of *Amaryllis belladonna* from California these then constituted the major part of the amaryllleae business of this country.

Quarantine 37, as everyone knows, shut out all these importations and left this country dependent upon such stocks as could be produced here.

As far as *Lycoris* is concerned, the story has been and still is a sad one. The Government was not liberal in allowing importations of propagating stock under special permit and consequently this has been a most difficult subject with which to work up an adequate commercial supply. I believe I can safely say that such a supply does not now exist and this is a great pity for it is truly a worthwhile subject. The few bulbs that are being used every year are obtained principally from the private estates adjacent to New York.

The sale of *Zephyranthes* has declined for lack of a sponsor or of someone to give them the prominence they deserve for it has been demonstrated very conclusively that their production, in adequate quantities, is a simple matter. I feel quite sure that a good volume can soon be worked up of this item. The trade should then be informed that a dependable supply of the leading varieties exists and should be furnished with definite information with respect to flowering dates and the best time to handle the dormant bulbs.

It is of course on the hybrid amaryllis (*Hippeastrum*) that the main interest is centered. After the quarantine, some of the Bermuda growers moved their supplies to Porto Rico and while these cultures did not persist, they did aid in maintaining some semblance of supply for the years when our local crops were inadequate. At that time Florida was gradually getting into the picture and some of the early workers with the hybrids had already begun to ship limited quantities to the northern markets.

I believe that it was about 1923 that the "Plant Amaryllis" Campaign got under way in Florida. Aided by the speculative boom that was then raging in that State, it was comparatively an easy matter to get many growers to make the plantings. Apparently every seed pod was saved in an attempt to increase the acreage as quickly as possible and millions of seeds were planted. To a great extent these plantings were made by those with no prior horticultural experience and this probably accounts not only for the unequal quality of stock but also for the fact that the market for the bulbs was not developed to the same extent as the supply.

A great many of these new plantings were induced by reason of some vague promise on the part of the seed sellers to provide a market for the bulbs when they attained salable sizes. This supposed centralization of selling effort left the growers with a false sense of security for when the large quantities of salable sizes had arrived, it developed that only a limited market existed. While not questioning the advisability of cooperative marketing for many crops, I feel sure that if the individual growers had, on their own initiative, sought to develop new outlets, the results would have been much more satisfactory.

When the supply of hybrid amaryllis was small, practically the entire output was consumed by seed houses through their catalog trade. A big disappointment to the growers of and dealers in these bulbs has been the failure of commercial greenhouse men to handle them in any perceptible quantity and later in this article I will attempt to give an apparent reason. The demand with the seed houses failed to keep step with the rapidly increasing supply, largely due to the fact that the bulbs were then not available in time for the usual fall bulb selling season and were finished before the bulk of the spring business got under way. Without question the bulbs can be cold-stored and held dormant over a much longer period than now prevails and by so lengthening the season, the demand will be much increased.

To take care of the rapidly increasing quantities, new outlets had to be provided and as the prices became more reasonable a new field was opened. Chain stores and department stores were at the time becoming serious factors in the sale of horticultural products and to this field the amaryllis grower and dealer turned and these outlets have provided the largest market for such bulbs as are now being sold and will unquestionably continue to be the leading final distributors.

But even with this large new outlet, the supply continues to be larger than the demand and prices have fallen to where the profitable production is now very questionable.

In considering ways and means to broaden the market and correct the price evil, we must have the ultimate consumer very much in mind. I think it is safe to say that over 75 per cent of the bulbs now being marketed are finally bought by amateur home gardeners who purchase the dry bulbs and attempt to flower them under home conditions. What induces these sales and how can they be increased?

A display of dry amaryllis bulbs on a counter does not, in itself, make an appeal. It is true that the size of the bulbs is sometimes impressive but unless people know what they are and what they will produce, few sales are made. Some of the largest distributors have very sensibly provided large display cards with colored reproductions of amaryllis flowers and these have been a big help. When coupled with growing-instruction leaflets, many new buyers have been secured.

In the early spring, it is possible through the North to obtain flowering plants of amaryllis and when these are displayed with bulbs, the sales increase enormously.

Then there is the time element that is most important. When home gardeners plant anything, they usually want action and they do not get action with amaryllis bulbs when they are planted in the early fall months. A few years ago the bulb dealers did not expect deliveries until November but the constant clamor for earlier delivery has stepped up the shipping date to where some are now asking for them as early as the first week in September. While appreciating the fact that more bulbs can be sold in two months than in one, I still believe that it is a mistake to ship amaryllis bulbs before November, and prefer to lengthen the season by cold storage rather than trying to anticipate it by sending out unripened bulbs.

Of course the quality of the flowers produced from the bulbs has an important bearing on the subsequent demand. When buyers secure bulbs that produce one or two scapes with large flowers of an acceptable color, they become most enthusiastic and not only are larger buyers the following year, but very likely induce many others to try them also. If, on the other hand, small, poorly colored flowers are produced, the effect is just the opposite. And so the importance of producing only the finest stocks cannot be too highly stressed. I am not in favor of sending out unbloomed seedlings but rather favor a thorough selection at flowering time and a separation of grades and colors. This can be easily accomplished by labelling each plant as it blooms. A satisfactory method of doing this is to use a wire meat skewer to which is attached a metal tag which can have a significant letter or number. Both of these are stocked by dealers and can be bought at reasonable prices.

And there is another important point to be borne in mind when considering the consumer's angle and that is the advisability of maintaining bulbs in a dry state

over an extended period. Personally, I incline to the belief that these bulbs do not take kindly to this treatment and consequently reflect it in the blooms they produce. I think experiments should be conducted to ascertain definitely: First—When should bulbs be harvested to produce the best flowers and at the same time provide the longest selling season? Second—Should the bulbs be shipped in a dormant condition or do they flower better when treated as live plants?

Finally, a determination should be made of the best sizes of bulbs to be marketed and in doing this the producer's side of the problem shall be kept very much in mind for it is economically absurd to put the producer to the extra expense of growing oversize bulbs unless it can be demonstrated that the size, number and quality of the blooms show a definite relation to the size of the bulbs. Each year sees a call for bulbs of a larger size and this condition will continue to exist because our horticultural buyers are accustomed to believe that the largest is always the best.

And now a word as to why the hybrid amaryllis have failed to register to a more satisfactory extent with commercial greenhouse men. As a cut-flower, a very limited demand exists for the flowers are difficult to handle and to pack and their stiff form does not lend to a great many floral uses. When used as a pot plant, the absence of foliage and this same packing problem have proved stumbling blocks. Then again some of these florists have had disappointing experiences with the receipt of poor strains. Unquestionably the selection of better types is to be considered as the main point in developing this outlet. I am encouraged to believe that the propagation by cuttage is now to be undertaken in a serious way and when named kinds are produced and become known, this trade will undoubtedly expand enormously.

And what of the future? I have always been a booster for hybrid amaryllis and feel today, as I felt many years ago, that they offer the outstanding possibility in the whole bulb line. Their size, beauty and the ease with which they can be so readily flowered under average home conditions is going to put them over in a big way. In this field they have no competition, for there is not another item that has all of these fine qualities.

The formation of the American Amaryllis Society will, I hope, coordinate the efforts of those who are working with amaryllae and be another big factor in their development.

R. G. HILL'S "A SURVEY OF THE UNITED STATES BULB INDUSTRY, 1931"*

Styled "A Preliminary Report," the survey covers briefly the following subjects,—sources of supply, consumption, areas of production, estimates of planting and production by growers and State officials, marketing and distribution.

The *Amaryllideae*, except *narcissi*, are dismissed in a very short section entitled, "Miscellaneous Bulbs" from which the following excerpts are taken,—

"There is a small domestic production of what may be classed as Miscellaneous bulbs . . . such as begonia, tigridia, muscari, ornithogalum, ranunculus, scilla, anemone, hyacinth, tuberose, fancy-leaved caladium, tritonia, calla, calochortus, *Galanthus***, *ixia*, *sparaxis*, *Nerine***, *oxalis*, *Zephyranthes***, and *watsonia*.

"The figures shown in Table 10 (Miscellaneous bulbs)** include *Amaryllis* (*Hippeastrum*)** in California and Florida"

*A mimeographed bulletin published by the U. S. Dept. of Agriculture, Bureau of Agricultural Economics, Washington, D. C.

** Italics and words in parenthesis are ours.—Ed.

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Winter Park, Florida

.....193....

Please enroll me as a member in the American Amaryllis Society, and send me a copy of the 1934 Year Book; I enclose \$2.00 to cover 1934 dues.

(PLEASE PRINT NAME AND ADDRESS)

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ORLANDO, FLORIDA

1934 INTRODUCTIONS

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With Headquarters In

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Price: In five or six-inch pots, \$2.00 to \$10.00, according to quality. Extra fancy varieties with giant size flowers from \$10.00 to \$25.00, according to quality.

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**YEAR BOOK
AMERICAN
AMARYLLIS
SOCIETY
1935**



VOLUME 2

Dedicated to
Theodore L. Mead

With three portraits and eighteen illustrations.

Edited by
Hamilton P. Traub
Mira Flores, Orlando, Fla.

THE 1936
NATIONAL AMARYLLIS SHOW
sponsored by the
AMERICAN AMARYLLIS SOCIETY
will be held in Florida.

For details write to the Secretary,—
MR. WYNDHAM HAYWARD,
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THE 1937
NATIONAL AMARYLLIS SHOW
sponsored by the
AMERICAN AMARYLLIS SOCIETY
will be held in
Southern California

This will be the year of the William Herbert Centennial and the William Herbert Medal, the highest annual award of the Society, will be awarded for the first time. For details write to

MR. RICHARD DIENER,
Southwest Regional Chairman
EXHIBITIONS AND AWARDS COMMITTEE,
Oxnard, California.

YEAR BOOK
AMERICAN
AMARYLLIS
SOCIETY
1935

VOLUME 2

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Published November, 1935

Preface

The one just passed has been an eventful year from the standpoint of the advancement of the amaryllids. Prior to 1934 this group of plants was generally neglected excepting by a few faithful enthusiasts. The attempted revival looked apparently hopeless to many and a few predicted certain failure. However, revival of interest in amaryllids was spontaneous from the first and with the publication of the 1935 Year Book of the Society, their advancement looks bright. In two years' time two National Amaryllis Shows have been successfully staged, the vegetative method of propagating amaryllids has been generally accepted, and breeders have been encouraged to introduce named varieties in this group. There is now a lively interest in the introduction of species for the hybridizer. Ideas and plant materials are being freely exchanged between enthusiasts in various parts of the world.

This issue is dedicated to Mr. Theodore L. Mead, the venerated pioneer horticulturist of the Southeast, originator of the Mead Strain of hybrid Hippeastrums and a Fellow of the Society. Mr. Mead has kindly favored us with a most interesting autobiography.

We are sad to announce the loss of a friend and one of our most valuable members in the death of Dr. David Griffiths. His inspiring and stimulating presence will be greatly missed. He stuck to his post to the very last. On February 28 he wrote, referring to his impending hospitalization, "I will have to do it (send the article on daffodil breeding) before the middle of March because I am going away at that time", and in March the sad news of his passing reached us. Dr. Wm. A. Taylor, former Chief of the U. S. Bureau of Plant Industry, contributes a concise biography which traces in outline the useful and inspiring career of Dr. Griffiths.

The year 1934 is a land mark for those interested in amaryllids for Dr. J. Hutchinson's phylogenetic classification of monocotyledons appeared in that year. The system is original and stimulating and that portion relating to the amaryllids and related groups was officially adopted by the Board of Directors and reference to it made in the final draft of the constitution in place of Baker's classification, 1888.

The Alstroemeriaceae, now a separate family, have been retained in the field of the Society, and the Hemerocallideae were added as representing, in *Hosta*, the connecting link between the Amaryllidaceae and the Liliaceae. The members of the Society will therefore be given the benefit of a phylogenetic outlook on a great plant group. These relationships are discussed more in detail elsewhere in these pages, and the portions of Dr. Hutchinson's classification in the field of the Society, have been reprinted for your information by the kind permission of the Author and Publishers.

We are happy to announce that corresponding members have been elected in Australia, South Africa, British East Africa, Germany, England, Argentine and Holland. Mr. Cowlshaw gives a stimulating picture of amaryllid activities in Australia. In fact, Australia challenges the rest of the world to show what it has to offer in fine amaryllids. His article is bound to stimulate a healthy exchange of ideas and plant materials and we are greatly indebted to him for his excellent contribution.

The Lady Muriel Jex-Blake contributes a most interesting article on amaryllid culture in Kenya Colony. It comes as a surprise to most outsiders to hear of the gardening progress made in British East Africa. To their continued success we send our best wishes.

Kenya Colony, British East Africa, is to be congratulated on its talented workers in the horticultural field as judged by the delightful book which appeared in 1934,—“Gardening in East Africa”¹ edited by Dr. Jex-Blake. It might well serve as a model for regional texts on gardening in this country. It contains a chapter on indigenous bulbous plants including the amaryllids.

The Lady Muriel Jex-Blake and Mrs. Frank Joyce, of Kenya Colony, have the gratitude of the Society for their sympathetic cooperation with the officers in their attempt to introduce plant materials.

With the publication of this volume, general recognition of the value of the vegetative method of propagating amaryllids has been achieved. Many “Doubting

¹Longmans, Green & Co., London; New York; Toronto. 1934.

Thomases" have been converted in the course of the past year. It is fitting and proper, therefore, that Miss Ida Luyten, as the pioneer in the field of vegetative propagation of amaryllids, was appropriately recognized by election to Fellowship in the Society. Her excellent article on the subject in the present issue is commended to all. It shows the true scientific attitude. The Society owes Miss Luyten a genuine debt of gratitude for her contribution on this important subject.

Lack of space forbids even touching on the more than sixty other articles in this issue. You will want to read them all. The contributors are to be congratulated, and deserve the thanks of the entire membership for sharing so generously of their experiences and time.

A few words about future issues of the Year Book are in order. The 1936 volume will be dedicated to Mr. A. Worsley, of Mandeville House, Isleworth, England, the Dean of the amaryllis fraternity. His autobiography has already been received, and its publication will be a most interesting literary event. A portrait of Mr. Worsley, and the description of a new amaryllid species, named for him, will also be included.

In recognition of the lasting influence of William Herbert's monograph on the "Amaryllidaceae" published in 1837, the Society will celebrate the William Herbert Centennial in 1937. The Year Book of that year will be dedicated to him and his work, and the William Herbert Medal, the highest award of the Society will be awarded for the first time.

In 1938, the Year Book will be dedicated to the venerable Mr. E. H. Krelage, and in the same issue the influence of Dutch and other European breeders on the development of the cultivated amaryllids will be adequately covered. Mr. Krelage will contribute his "Autobiography" and will also supervise the symposium on Continental European amaryllid culture.

All your officers have endeavored to serve efficiently and unselfishly, but an especially large bouquet of brilliant amaryllids should be handed to your Secretary, Mr. Wyndham Hayward, to match his faithful devotion and his indefatigable zeal in the interests of the Society. The success of the Society has been in greatest measure due to his efforts; we who have had the opportunity to help, are glad of the privilege of serving along with him in the worthy undertaking.

On the usual weekly visits to his fine country estate, Lakemont Gardens, in Winter Park, the writer has had an opportunity of observing the excellent work he is doing in the field of amaryllid culture. It is not surprising to note that he is gathering together an outstanding collection of amaryllids as well as a great many other worthy plants.

The time has arrived when this preface must be submitted to the printers, and your editor is in Puerto Rico.

This beautiful Island with its varied tropical flora is a seventh heaven to the plantsman. The members will be interested in the list of indigenous amaryllids collected and sent to the Secretary for the trial collection,—*Hippeastrum equestre*, *Zephyranthes carinata*, *Z. tubispatha*, and a *Hymenocallis* species.

HAMILTON P. TRAUB.

Luis Munos Rivera Day,
July 17, 1935
Mayaguez, Puerto Rico.

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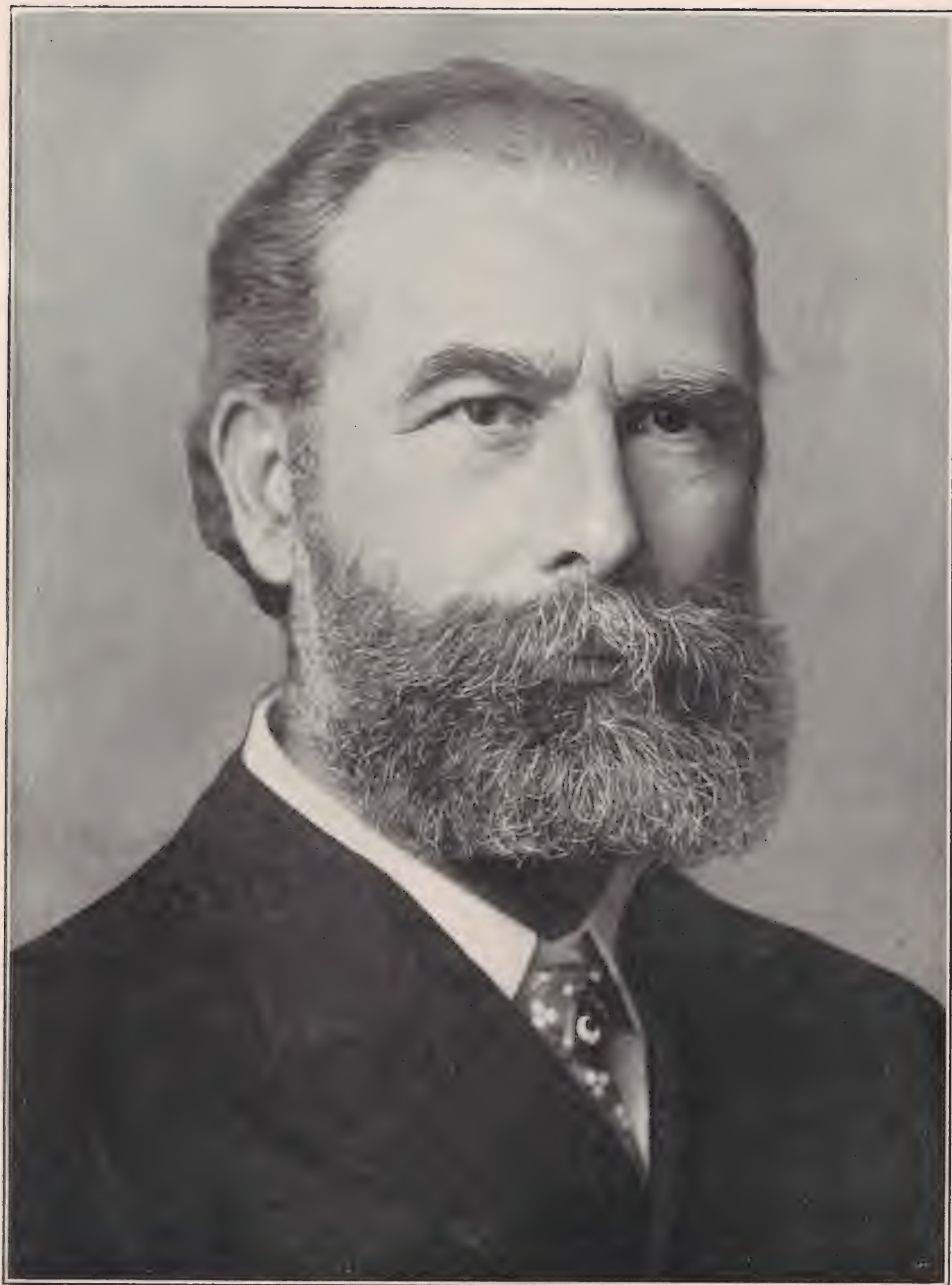
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Victor Georg

Springfield, Ill.

Theodore L. Mead

At the age of 51.

VOL. 2 YEAR BOOK 1935

AMERICAN AMARYLLIS SOCIETY

Theodore L. Mead

Naturalist, Entomologist and Plantsman

AN AUTOBIOGRAPHY

My ancestors on my father's side came from England in 1642, while my mother was of Huguenot extraction, her forebears having left France after the Edict of Nantes in 1685. They made their home in New York City but I was born at Fish-kill, N. Y., February 23, 1852. The years from ten to twelve were spent with my parents and brother in Germany studying French and German. Upon returning home my education was continued in the public schools preparing for entrance to the College of the City of New York.

At that time the teaching, being given over to Tammany political appointees, was of no account, mostly parroting recitation by rote and many of the teachers were unable to pronounce unusual words. One "miss" was a failure and punished with a severe caning with a rattan in the hands of the principal. They never offered to give me a licking; I think they were rather respecters of persons and my parents would have removed me from the school rather than permit any assault and battery upon me. But some of them got thrashed and to see it done hurt almost as badly as if I had been beaten myself although none of my particular friends were involved.

In 1867 I entered the Introductory or Sub-Freshman class of the City College. I remember my rating in Science was about No. 35 and in Latin, etc., about No. 60 in a class of 500 students. I asked my father to take me out and to let me go to the French Exposition instead. He said if I could find another dependable boy to go along I could go, but not alone. I had found a couple of good friends in my class—otherwise an extremely mixed lot—and we were almost inseparable and they agreed to go but their parents backed out. My brother had entered the Columbia College of Mines and couldn't go but my mother offered herself as chaperon so I should not be disappointed and we had a great time. We spent about a week at the French Exposition, where I was greatly impressed by the mechanical exhibits. The Jacquard looms weaving damask and figured silks seemed wonderful, but on the whole the great variety of exhibits was rather confusing to a boy. From Paris we went to Rome, Naples and Vesuvius, then to Como and the Italian lakes. At Adelsberg, the grotto, like the Kentucky Mammoth Cave, with its eyeless fishes, was visited. A stop was made at Idria to see the mercury mines and at Cracow to see the slate mines that had been worked for a thousand years. Then on to St. Petersburg and Moscow.

Before leaving Russia I saw in a glass house the tallest coconut palm of Europe; it was pushing its fronds through the glass dome—they had already dug a hole 40 feet deep for its tub—but it continued to outgrow its space. After a little while at Stockholm and Christiana, now Oslo, and a peep at Copenhagen, it was time to be thinking of getting home.

At Dresden there was a specialist in the collection and sale of butterflies. My mother said if I would go straight to Paris and then home she would let me get a collection of butterflies valued at \$50. Like John Gilpin, though I was on pleasure bent, I have a frugal mind and, knowing that there was a premium on gold, I told her that if she would make it \$50.00 in gold I'd agree. We struck the bargain. When I got that collection, I had to have an insect proof cabinet to preserve it in and that I got from my dad. That was really the origin of my ability to collect scientifically and after a while with the aid of Mr. William H. Edwards, the chief authority on North American butterflies, my collection stood third among North American butterflies. The British museum stood first, having all the types from the arctic

regions. The collection was not so very important as it might seem as there were only some 600 species known north of Mexico. Nevertheless, it seemed a triumph to get a new one. A trip to Florida in 1869 gave me my most spectacular specimen, *Papilio calverleyi*. Only one other specimen of that type has ever been found. Mine, a female, the other a male from Long Island, New York. No duplicate has yet appeared although sixty-five years have elapsed. The female is still in the Carnegie Museum at Pittsburgh.

That summer (1869) I asked Mr. Edwards as to the best place to collect within 500 miles of New York. He said that West Virginia was worth while. I got a boarding place and was with him all summer. His son and I became the best of chums. I was able to help a lot in getting eggs and life histories of butterflies. Mr. Edwards' discovery was that if any mature butterfly was confined with its proper food plant, eggs would almost certainly be laid. After that their breeding was a comparatively simple matter though in some cases the hatched eggs refused to grow unless provided by refrigeration with an artificial winter season.

In 1868 I was elected a member of the American Entomological Society, afterward the Entomological Section of the Museum of Natural Science, and I usually attended the monthly meetings held in Philadelphia.

In 1871 Mr. Edwards, with whom I had become intimate, suggested a summer in Rocky Mountain country, sharing the expense and sharing the butterflies. In the Rocky Mountains I found twenty new species of butterflies, the best ones named by him *Argynnis Meadii*, *Colias meadii* and *Satyrus meadii*. Mr. Scudder named a moth *Heliothis meadii* and also a Geometer (*Scotosia meadii*) for me.

After the Colorado season was over we continued to California to visit the entomologists there. We returned via Panama by steamer. We did some collecting in Panama and I filled an empty trunk with orchids and a live Iguana or two.

My bother's hobby was astronomy, studying comets and double stars, and he got a 4½ inch Fitz lens mounted equatorially and later a six inch lens. He persuaded my father that although I was only a boy of 16 or so I ought to have a microscope of equal value and we ordered a binocular by J. & W. Grunow with objectives of 2 inch, one inch, one-half and one quarter and one-eighth inch focus, the last two being adjustable for the thickness of coverglasses, giving a magnification of from 20 to 1600 diameters. They were tested by the Columbia University authorities and pronounced good of their kind, and we added an achromatic condenser and a polariscope, bringing the cost of the apparatus up to about \$400.00. I was just a boy and though I enjoyed the microscope, did not make serious investigations. I made a few fair photo-micrographs but at that time no dry plates were available and only the wet process could be used—troublesome and sloppy and the wet negatives had to be developed immediately. My most serious use of the microscope was in preparing a study of the generic characters given in Mr. Scudder's systematic revision. The numerical relations given as characterizing the different genera proved valuable beyond any expectation and the paper was published in the Canadian Entomologist in December 1876 with other notes at different times in the same publication.

In 1872 my time was mostly devoted to working over the Colorado butterflies and writing Chapter 8 in the Wheeler Expedition volume devoted to the insects collected by various biologists in which I included all my notes as to the species I had taken in Colorado.

UNIVERSITY DAYS, 1874-77

Mr. Edwards' son, my chum, was very urgent that I should do something more practical than butterfly collecting. We were fond of each other and he had great influence with me and finally I told him if he would go to Cornell University I would go too and take the course in Civil Engineering. It was a great mistake as I should have specialized in biology where my inclination lay. I made a creditable record and received in 1877 a first degree in Civil Engineering followed by the full degree as Civil Engineer in 1890.

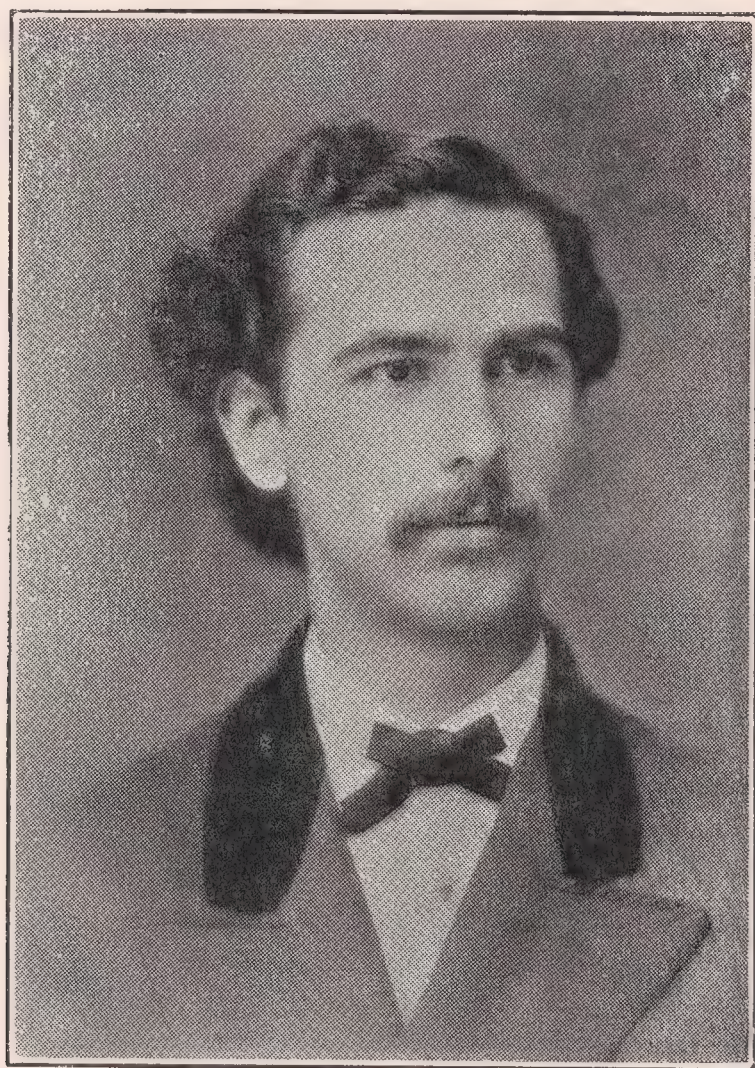
The engineering boys were kept hard at work at recitations and laboratory work. They boarded with citizens mostly. Although they had athletic diversions I knew almost nothing of them. I never had a baseball in my hand until over 22 years of age. My spare time was given to Natural History, and I had a good deal of leisure as I had had a good mathematical groundwork at the Columbia College

School of Mines. For me work in chemistry or any branch of Natural History was just play, but the higher mathematics courses were difficult. I did not have much contact with the Botanical Department under Prof. Prentiss where there were good facilities. Professor Fuertes, head of the Engineering Department, was most kind and always a friend. His youngest boy, Louis, the bird artist, was always one of the most valued of my friends and Fraternity brothers. Dr. Wilder in biology was helpful but would stand for only serious work.

I sold my butterfly collection to Carnegie Museum at Pittsburgh in 1877. Notes on Insects and Flowers were published in the Popular Science Monthly for May 1877.

One of my good friends among the Alpha Delta Phi boys was a genial Texan, afterward known to history as Colonel House, President Wilson's friend, who was the only one I know who could utilize energetic cuss words and make it sound as though he were pronouncing a benediction.

My initiation into Alpha Delta Phi seemed to me the most wonderful and the happiest thing that had ever come to me, the very ideal of brotherhood and fraternal



*Theodore L. Mead as an undergraduate university student;
at the age of 22 years.*

love. As I wrote the boys nearly fifty years later, that day stood out as one of the three wonder days of my life, with my wedding day and the day of my confirmation in the Episcopal Church.

The Alpha Delta Phi boys were anxious to build a Chapter House of their own. They had then only a thousand dollars cash in hand but a graduate brother guaranteed their contracts for building a comfortable and suitable Chapter House costing \$14,000.00. I wanted to do all I could to help but my means were limited. My mother who was anxious for my spiritual welfare wrote me that I could lend the boys \$500.00 for their house if I would agree to attend one Orthodox Evangelical Church service every Sunday for a year. My father wrote on the envelope "Don't you do it, Ted. Charge \$10.00 a time and stop when you get sick of it." I got the money for the boys. They insisted on crediting compound interest and twenty years later paid the debt in full with a thousand dollars which came in just right as the freeze of 1894-95 had destroyed our orange groves and incomes. The

old house was duly paid for and the present one is a beauty costing something over \$205,000.00 besides a \$15,000 lodge building erected as a memorial building, by his mother, to a boy who died while a member of the Chapter. The last initiation I was privileged to attend was in 1926. The boys invited me to come and give the "charge" to the initiates and added that it was customary to provide transportation both ways, in this case 3000 miles to Ithaca and return. Of course I accepted the invitation and the boys actually said "it was worth it." They presented me with the latest badge of the Fraternity and in it claimed me for not only my own class of '77 but adopted me into the class of 1926 as well.

POST GRADUATE ACTIVITIES, 1878-82

In March 1878 my parents and I started for California having obtained authority to stop over one steamer between Panama and San Francisco at Colon, 1971 miles. As the train for Panama did not leave till the next morning we walked along the



*House occupied by Mead party in Acapulco, Mexico, April, 1878
(Calle del Pacifica)*

Reproduced from freehand pencil drawing by Theodore L. Mead

railroad tracks for three miles or more finding the ground much parched and overgrown with cattail-like rushes and papyrus reeds and great clumps of salt water ferns and morning glories. Orchids and epiphytes had a stunted and dried up appearance doubtless due to the drought. Butterflies were scarce and represented by only common species and insects of other orders even scarcer. Early in the morning of the 29th we had breakfast and took our places in the cars of the Panama railroad. These were very poorly and cheaply constructed, worse than emigrant cars I had seen at home. As we entered the country epiphytes became more abundant but there were many bromeliads and I noticed a few orchids growing. Many trees were leafless owing to its being the dry season. We were transferred to the steamer Colida and on the 31st we anchored at Punta Arenas and just before daylight on April 3 we passed a smoking volcano near La Libertad in San Salvador. We anchored off the town which is a surf port and receives the swell direct from the

Pacific Ocean and small boats cannot land except at the wharf. I walked through the town and up the hills. Even from the vessel there was no verdure to be seen. The ground was covered with dead leaves. Some of the orchids seemed deciduous but doubtless made their growth in the rainy season, and one species of orchid was in bloom. I followed a dry water course and saw one or two handsome butterflies (*Papilio* sp.). Along sandy and gravelly banks were prickly pears in bloom and fruit. *Cereus triangularis* grew here and was sometimes used for fencing but not like the columnar *Cereus* in Punta Arenas. "Resurrection Plants" (*Lycopodium*) grew along the hillsides away from the sea. April 3 to 8 was occupied by the trip to Acapulco which apparently was completely land locked. At a little distance from shore the mountains rise abruptly to a height of 2000 to 3000 feet. They are covered with vegetation but not so as to hide the many large boulders especially near the summit. About half the trees and bushes were leafless but here and there some leafless trees were in bloom. The Pacific Mail agent directed us to the house of Dona Rosa Clarke, the widow of an American. Don Rosa showed us a whole house which we could occupy and take our meals with her. The house was quite new and cost, with the grounds, \$5,000. It rented by the year for only \$12.00 or \$15.00 a month which seemed like a small interest on the investment. Like the usual Mexican house, there was but one story. The house had two rooms, one 20x30 feet and one 20x20 feet. The floor was of common red tile 8 inches square laid in mortar. The roof which also was tiled is sloping and covered both house and a ten foot veranda on either side. The tiles were also laid in mortar, that is to say, a large dab of mortar at each tile kept out driving rains. The house was a plain parallelogram without break except for doors and windows. Each of the two rooms had a door facing the street and protected by wooden shutters and iron gratings. The walls were of adobe and about 20 inches thick. For mother there was a mosquito bar. The beds were very hard and by no means restful. Shortly after six o'clock we went to the casa of Dona Clarke for supper. The meals were of Mexican dishes except the bread which comes from the bakery in French style. At seven our breakfast was brought to us by Silverio, a serving lad, 12 years old. It consisted of excellent coffee with sugar and a little milk and fresh rolls. Sometimes we had mangoes and other fruit from the garden and Silverio was always ready to cut green coconuts for our refreshment.

Later in the day we went to the bay and examined the purple sea urchins and star fish and sea anemones and odd crustaceans looking like our pictures of trilobites. At noon we had dinner consisting of a thick soup and vegetables including ripe peas boiled and a dish of "roast beef and eggs" stewed with garlic, chicken stewed with garlic, onions stuffed with hard pot cheese and fried in batter, and boiled plantains and sweet potatoes. At all meals we had tortillas of the white Indian corn of the country soaked thoroughly and ground by hand on a stone having a slightly cylindrical shape by means of another stone rolled, grasped in both hands. The operation seems quite long and laborious as the corn is ground to a fine paste, pressed thin in the hands and cooked without further addition or preparation.

Captain Coffin of the Pacific Mail store-ship kept his ship anchored in the bay to avoid paying custom duties on the P. M. supplies. He took us on an excursion on the bay. The pelicans allowed us to approach within a few feet: they were very tame. Though occasionally shot for sport, the natives rarely molest them. He took us over the store ship and we visited the American cemetery where are interred the remains of those who have died at sea and a good many American settlers at Acapulco. It is just as well that our visit was during "las secas"—the dry season as Acapulco had the reputation of being a terrible yellow fever nest during the rains. We made many prospecting trips. April 14th I had collected some cacti and got a bag of Mexican matting to pack them in but a big scorpion soon crawled out. I exterminated him with fire and sword, i. e. my knife and lamp. April 19th the steamer started for San Francisco. On May 7 we left for Los Angeles and the San Gabriel valley. Los Angeles was not much more than a village then but it seemed attractive. I found a 40 acre tract near town with an orange grove and a house for sale for only \$6,000 and my father said I could have it if I liked but at the Sierra Madre Villa the owner wished to borrow on mortgage at one per cent. a month. The Villa was a charming place with its own flowing water supply and my father thought the prospective income too attractive. A few months later the owner paid up the mortgage in full and I missed out as Los Angeles now has over a million of inhabitants and petroleum was

found all over the place. The acres of April and May flowers all the way to Los Angeles were a delight to the eye but there was almost no living vegetation in the Mojave desert by May 23. A week later we were in the Yosemite valley for a six weeks stay. Nearly everyone dashed in and left again in three days but we went first horseback over all the trails and then repeated the trips on foot, overpowered by the magnificence of the rocks and scenery. Every day of our stay they seemed more glorious and wonderful. We got tickets from San Francisco to New York allowing for indefinite stop-overs anywhere. Before leaving the Yosemite Valley I gave an illustrated lecture on insects at the local district school. The audience was small but seemed appreciative. After a very short stay at the Big Trees at the Mariposa station, we left San Francisco for Summit Station, Nevada and Lake Tahoe and Tallac Peak where I found a rare Alpine butterfly allied to the Mt. Washington and arctic species which I afterwards named *Chionobas ivallda* (Mead). We camped a couple of days near Freel's Peak and Tallac Mountain, to investigate the butterflies. We visited Virginia City and went down in the silver mines. Collected for a day or two at Cottonwood Canyon, Utah, visited Salt Lake City and had a dip in Great Salt Lake; visited Green River, Wyoming, noted for the fine thin shales containing impressions of leaves and insects. I visited entomologists near Chicago and Davenport, Iowa. In September I stayed for a couple of weeks with my future father-in-law, Mr. Edwards, at Ithaca. From Ithaca I visited most of the active chapters of my Fraternity in New York and New England and was received everywhere with affectionate regard. A few weeks were devoted to studying the Catskill butterflies as Mr. Edwards was anxious to trace the life history of *Limenitis arthemis* which was suspected of being a dimorphic form. After a few days visiting my friends in Newport I went to Martha's Vineyard and Nantucket.

In 1880 I spent some time in Ithaca, New York, visiting my Fraternity chapters from New Haven to Ann Arbor, Michigan, and Dr. Hagen at Cambridge with whom I dined. He showed me the biological collections which had constituted his life work. He spoke most kindly to other professors of my entomological work. I visited the Harvard Chapter which numbers among its graduate brothers both the Roosevelts—Theodore and Franklin D. In July I went to Newfoundland and got many of the local *Papilio brevicauda* at that time only as caterpillars which later hatched in New York giving a fine series of variations. The black flies of Newfoundland were a terrible handicap. They went through fine mesh tarlatan like weasels through a rail fence. Soon after leaving the hotel one's face would begin dripping blood and the bites were very poisonous. I told my father that the next year we would go a thousand miles south instead of north to see if it could be any worse. We learned afterward that copious anointment with tar and lard would keep them off. In Florida, of course, we encountered redbugs but they were but a mild annoyance.

I attended Columbia University Law School in 1879 as my Dad said "You must know law to keep out of it".

In 1881 in collaboration with an English entomologist we published an illustrated magazine called PAPILIO, devoted to lepidoptera exclusively, which appeared in four volumes in 1881-1884 and then was continued as Entomologica Americana now being printed by the Brooklyn Entomological Society.

In 1882 I was married to the daughter of William H. Edwards, the author of "The Butterflies of North America", whose publication began in 1868 and continued till 1884. We took our wedding trip to the English cathedrals with incidental studies at Kew where I reveled in the wonderful collections.

FLORIDA IN THE 80'S

In 1881 my father bought an orange grove for me at Eustis, Florida. After our return from Europe in 1882 my wife and I made our home at Eustis for six years. The Eustis groves grew well but were slow in producing fruit. After a minor frost or two, my father took the property off my hands and enabled me to buy twenty acres of bearing trees at Lake Charm, near Oviedo, producing up to five thousand boxes at a crop. This was in 1886 and in that year my long hoped for baby arrived. She was charming and strong and robust and it seemed as though my every wish were to be fulfilled. When she was four years old she contracted scarlet fever and after seventeen dreadful days and nights she was gone.

In the 1880's in Florida there was almost a certainty of fair crops but no certainly of fair returns. Men like Mr. E. S. Hubbard and Mr. W. S. Hart of Hawks

Park had their regular customers for fruit and little people like myself depended on the Fruit Exchange and sometimes got a fair price for their fruit. Cooperation was among few, and far between, and jealousy and doubt were the rule among those handling our products on commission or otherwise. A little example in my own experience of one of the most esteemed among those handling fruit and vegetables for us was illuminating. We customarily marketed our crops at the Farmer's exchange. Our friend asked us to let him have 500 crates of fine lettuce and said he could get \$5.00 a crate for it and we reluctantly consented. They went by express on his order. Ten days later we inquired and were told that returns had come in. Three months afterwards we received a settlement at nine-tenths of a cent per crate for the 500 crates. The check was \$1.38 and no explanation was forthcoming. Our friend had doubtless "taken a chance" and turned them over to some irresponsible commission house in New York and, having been "stung" could do no less than transfer the sting to the grower. An auction house made a specialty of oranges for export. A special fee of ten cents a box was charged for selecting fruit specially suitable for export. He sent 200 boxes of my oranges to Paris and collected 200 francs for loss on the next carload I shipped. I argued that if his judgment were as poor as that he should rebate the \$20.00 fee I had paid him and he saw the point and returned it.

The crop of 1889 on 20 acres at Lake Charm yielded 3698 boxes and the return F.O.B. was \$6,526. The cost of picking and packing at that time averaged not more than 33 cents a box. The crop was packed in my own packing house; the cost included labor and all materials. We saved and sold 2132 boxes before "the big freeze" in 1894-95 from our 20 acres but nothing more for 20 years.

My venture in vegetable growing had its ups and downs. I put a \$1200 cover on an acre of cucumbers. The December 1894 freeze had destroyed every cucumber in Florida and by replanting during Christmas week my crop on one covered acre was 1474 baskets of cucumbers which sold for \$2254. The second covered acre suffered from cold winds and downy mildew and produced nothing.

COLLECTING PALMS

I had come in contact with English and Italian collectors of palm seeds and had contracts to be supplied with every lot or kind brought in by the collectors. We had an infinite amount to learn as to Florida climatic conditions . . . still at the time of the Great Freeze in 1894-95, I had 250 species in pots or planted out.

In the early years at Oviedo I used to import great quantities of palm seeds from foreign dealers abroad. One day I received as many as 80 registered packages of seeds in the mail. On receipt of the seed, I would open them up carefully, and plant the palm seeds in a mixture of crushed charcoal and chopped sphagnum moss, in pots in my shaded greenhouse. I marked them with zinc labels and watered them carefully until the seed sprouted. When the seeds began to sprout I would take them out of the sprouting medium and pot them up in rich earth as soon as possible, the remaining unsprouted seeds being left in the pots of charcoal and moss until all chance of their growing was gone. This was necessary because of the uneven habit of sprouting that some of the seeds have.

One of the slowest palms to come up in my experience was *Acrocomia totai*, one of the spiny species, the seeds of which stayed in my sprouting pots for four years and three months before the first seedling shoot appeared. After five years a number of others germinated in the same lot of seed.

I got the majority of my palm seeds through Dammann & Co., Mr. Sprenger, Chief Collector at San Giovanni a Teduccio, Italy, and whatever I was able to get through Benary & Co. and Haage & Schmidt, Erfurt, Germany. I was to have samples of every palm seed brought in by Mr. Sprenger and any other seed thought to be interesting. All plants were immediately planted in pots of crushed charcoal and sphagnum, labeled, and the pots imbedded in a zinc box. There were many *Phoenixes*, *Chamaedoreas* *Arecas*, and *Elaeis*, colored *Latantias* like "rubra" and "Commersoni" and *Caryotas* and species of *Cocos*, but hardly any examples of the rattan palms offered to sprout. I kept samples of many but the names often seemed doubtful. For example, I had seven alleged species of *Phoenix*, varying in size from my little finger to the size of coffee berries and all as "*Phoenix siamensia*".

A good many of the more delicately leaved species were attacked by fungi and bacteria making black lines along their principal nerves. It was told to persons to

whom I tried to dispose of them that these were diseased and worthless and could not be brought back to health. None of the *Cocos* or *Phoenix* suffered in this way. I planted out most of the *Cocos* and *Phoenix*. Many of the *Caryotas* and *Chamaedoreas* and also the *Latantias* froze. After the big freeze it seemed useless to continue with tender things. As my mother had better water protection at Eustis than I had at Lake Charm, I sent most of the species to her but most of them died. If I had had any correspondents on the lower east coast I should have sent the supposedly tender things to them but there seemed nobody specially interested.

THE GREAT FREEZE, 1894-95

In 1894-95 came the great freeze destroying the Eustis property and my groves at Lake Charm beyond repair and reducing my income from about \$100.00 a week to almost the vanishing point. On this reduced income my wife and I lived for the next year owing no man anything except debts of love and affection; although things became easier afterward, experimenting mostly had to be given up. The 200 acre lake-front and residence at Eustis had cost about \$40,000. After five years the best offer for the property was one dollar an acre for the 100 acres of uncut pine land, but I later sold it for \$5000.00. Twenty years afterwards the purchaser showed me a contract to sell it—during the “boom”—for \$300,000. but the boom soon faded out.

During the freeze of 1894 the temperature went to about 17°F at Lake Charm and the citrus leaves and the largest twigs were destroyed. No very serious damage would have ensued if it had not been for the second freeze in February 1895, six weeks later. In the meanwhile, the trees being full of sap, made a tremendous growth from all the unfrozen limbs and branches making shoots of from one to two feet long covering every tree. Then came the second freeze destroying all this material and the trees had no remaining stored up material to make new growth so that the injury was great. Numerous subsequent freezes destroyed most of the new growth that the trees were able to put out. It seemed to me that the trees might better begin new tops from near the ground but that was a mistake owing to the numerous minor freezes that kept coming for several years. The most successful growers sawed off or chopped off everything down to the size of a man's arm and the new shoots from the body of the tree stood the frost better than smaller ones from near the trunk. My nearest neighbor and friend borrowed \$10,000, spent for cultivation and fertilizer; the other sufferers did the best they could, using muck for bedding the animals in the stables. With such fertilizer some of them were successful in bringing their trees back. Without some sort of fertilizing the task was hopeless.

At the time of the 1894-95 freezes I had stoves in my greenhouses to protect my orchids and other tender plants, but everything outside, that was not hardy, was hard hit. My orange grove which was of some 20 acres in extent, on the slope at the rear of my house, was equipped for irrigation with a hydrant every 40 feet. On cold nights I ran the water with a 20 horse power engine. Between the first “freeze” of December 1894 and the later one of the following February, which totally destroyed the trees, I saved and marketed 2200 boxes of oranges. The grove was of old trees, some of them giant size, and all heavy bearing. The crop had netted me \$7200.00 some years. The two successive freezes killed my trees down to the ground, and they never came back in a satisfactory manner. At present all the site of the old grove is a dense woodland. I planted small trees a number of times after 1895, to get a new start, but a few winter frosts cut them down and I gave up the attempt.

Central Florida was nearly deserted after the “Big Freeze”. Many of the grove owners left the state for good, abandoning their properties without any precaution for their maintenance.

ORCHID BREEDING

I had accumulated a pretty good collection of orchids not hurt by any freeze and for years the one thing I did was to study out the means of raising these from seeds. Hybrid seeds were available by millions from fine pollen supplied by Northern experts. Aseptic methods of culture had not yet been invented. The more natural methods of growing on suitable bark and fern roots stripped from the trees were subjected to a terrible handicap due to the devouring propensities of tiny midge larvae which ate the compost together with the tiny plants from the thalloid stage

on literally by the thousands of millions. No adequate protection seemed possible. As the natural propagation of seedlings seemed more successful up in more breezy places, or at least at higher elevations, I installed a water ram with finest cyclone nozzles forty feet up among the live oak branches but without much avail.

My best results were from a case about 30 feet long covered with glass containing live sphagnum and supplied with currents of moist air on which pillows of cheese cloth containing ground up decaying oak leaves with sphagnum, first sterilized by heat and then infected with symbiotic fungi obtained from the little orchid plants that had come up among my experiments. A friend permitted me to divert his four-inch flowing well giving about 100 gallons a minute to a water wheel which ran a fan blower at about 1000 revolutions per minute. The plantations were protected from the weather by a greenhouse cover. The air was passed through a cheese-cloth filter and I had little trouble from molds and none from insects, though afterwards in my regular greenhouse the midge larvae were most destructive. The air was moistened by a case containing live sphagnum and pots of it through which the moistened air circulated. This case was mostly of glass to make sure of the proper condition of the sphagnum. As there was a constant strong current discharge outward from the case there was no trouble from the access of insects. A lamp stove in the moistening case kept the air warm on cold nights without the products of combustion entering the case. Among the pillows in the case were many plantations from mixed seeds of every available kind so that if conditions proved favorable there should be innumerable plants available. A typical successful plantation gave several hundred leafy rooted plants averaging half an inch across of *Cattleya trianae* x *Laelia flava* between February 12, 1903 and June 16, 1904.

During my temporary absence in the north this case and all the glass covering my plantations were stolen and carried away and I never got any trace of the thieves. Although most of the machinery was left intact, I was so discouraged that I had to give up the plan as there was no certainty that the thieves would leave anything portable. They began with the oil cups and the glass and all my reserve bulb boxes from the packing house and then all the window sashes from the building.

I had intended to leave all my orchids and greenhouse plants to the Royal Palm Park but the December 1934 freeze was so destructive and the damage was so severe here, that I expect to send what is left to Mr. Clifford C. Cole of Coconut Grove who has means to care for them and is, himself, expert in their care, to be kept as the Mead collection at his home.

As to helpful orchid experts I was greatly indebted to Oakes Ames, Esq., of North Easton, Mass. for advice and assistance, and to Mr. E. O. Orpet, now of Santa Barbara, Cal., formerly gardener at S. Lancaster, Mass., for fine pollen and to Mr. Robert Grey with whom I exchanged orchids.

From time to time my orchid notes were published by the London "Orchid Review" describing among others *Cattleya oviedo* and *Cattleya meadii* (Rolfe).

AMARYLLIS BREEDING

After saving what I could of the young orchid plants, I gave most of my attention to the breeding of Amaryllis (*Hippeastrum*) bulbs, being greatly helped by Mr. Henry Nehrling allowing me to take whatever I wanted from his fine pollen. Besides the extremely dark and almost or even wholly white shades there were encouraging rosy pink ones and I found two specimens with just a hair line color around each petal, and intercrossing these I laid a foundation for nearly white varieties with a narrow border around each petal. My sales were mostly confined to seedling bulbs at ten cents for mixed and fifteen cents for those under color. I tried for a market for cut spikes but though the dealers said they bloomed perfectly, instead of offering them for sale they dumped my boxes refusing to attempt sales in competition with their own flowers. Perhaps a little more persistence would have found a market for cut spikes as they were most gorgeous. One serious mistake was to allow visitors to select any seedling flowering plant at 50 cents, although reserving anything that seemed rather extraordinarily fine for breeding. Meanwhile I had a partnership Market Garden at Sanford for the sale of vegetables with varying results.

I suggested to my business partner as a worthwhile venture, five acres,—four acres of paper white *Narcissus*, then the most promising of bulb speculations, and one acre of my fine crossbred Amaryllis.

My partner seemed to think there were too many diseases among the young Amaryllis plants to make them worth bothering with and refused to concede that my crossbred seeds had any market value whatever; but when we had raised a million Paper Whites and one acre of fine Amaryllis, Mr. Drewry of Daytona Beach purchased our five acre crop for \$16,000.00. The remaining Amaryllis at Lake Charm were included in the sale, at various prices according to size from 2 cents to 15 cents each but Partner said they were of no value and that I was welcome to whatever I could get for them. As near as I can figure it out, they brought around \$3,500. which was by no means a negligible item.

"While the quitting was good" I sold at cost my 5 acre plot at Sanford and closed my chapter of Amaryllis culture except for a reservation of about 700 specially fine bulbs. I cleaned them all and soaked them in semesan bel as a fungicide, retiled the land and put in new water pipes and grew a crop of celery to refresh the land but they began to do very badly in too sour soil and if not removed to a new location they would have all perished miserably. They are now being cared for in an entirely new location near Orlando by Mr. John R. Springer, and seem to be recovering in the new soil from all their troubles. In their first location they had grown and bloomed magnificently for twenty years or more.

CRINUMS, DAYLILIES, GLADIOLI, CACTI, ETC.

When I first came to Florida there were very few crinums growing in the state to any extent. Besides the native *C. americanum* there were *Crinum amabile* and its related *C. augustum*, which the early British settlers had brought in from Jamaica, *Crinum kirkii*, *C. asiaticum* and a few others of the "Milk and Wine" type. In the early days, sometime around 1890 or before, I obtained a large and extensive collection of crinum species from an English collector named Lancaster at Lucknow, India, who made a specialty of crinums and allied plants. He sent me nearly 80 species and varieties of crinums besides a number of alocasias and other plants.

I drained a small muck pond in front of my house, and grew the crinums there, endeavoring to raise as many and as varied hybrids as possible. Unfortunately the complete collection, with the exception of a few bulbs that I had in another location, and others that I had given away, was lost when my drainage tiles stopped up and flooded the old pond area again. I often wondered what became of the Lancaster collection in India.

When I first planted seeds of my crinum hybrids, I lost most of them by setting them out in the high, sandy orange land, where they grew slowly indeed, and it was fifteen years before they were as big as carrots. However, I replanted them later down on my sub-irrigated celery land, in the low hammock section, and the bulbs rapidly grew to blooming size in this rich, moist location. The best results of the hybridizing work was my named hybrid crinum "*Peachblow*". As I have no records of the crosses made, and it was 17 or 18 years after the cross was made that the plant bloomed, I have no idea what species were used in it. Possibly *C. moorei* was one of them. It is a free blooming crinum of vigorous growth under good conditions, and has a delicate perfume. The color is light pink, nearly white, when open, but more intense pink on the reverse side of the petals before the flower has opened.

The late Mr. Nehrling was another sincere crinum enthusiast in Florida at that time and later, and we cooperated in this work to some degree.

At present I have in my collection a large stock of the "*Peachblow*", "*Ellen Bosanquet*", *Crinum amabile*, *C. scabrum*, *C. virginicum*, *C. giganteum*, and a fine type of the "*giganteum*" which may be a hybrid, but is smaller in size.

More than 10 years ago I entered the hybridizing of *Hemerocallis* or Day Lilies to see what could be done in them. I obtained crosses, growing numbers of seedlings to blooming size. Out of these I have introduced only one variety, my "*Chrome-Orange*", as outstanding. It is a handsome flower, of slightly different color than any other *Hemerocallis* that I have seen.

These Day Lilies are very easily grown in Florida and elsewhere, and are easy to hybridize, the difficulty being to originate new types of sufficient novelty or improved characters to make it worth while to introduce them.

My efforts at hybridizing with the gladiolus began about 18 years ago when I bought a single bulb of the variety *Golden Measure*, which was new and sold at \$5.00

each at that time. I also obtained some of the best primulinus varieties I could buy and a few species, crossing them on *Golden Measure* for the first generation. Later I crossed the results back on *Golden Measure* again. I obtained, in time, a selection of choice seedlings, with five inch golden yellow flowers, growing 5 and 6 feet tall, and which proved admirably adapted to our climatic conditions. Some of them were fine yellows, some had flecking and dotting with orange and coppery red. Within a few years I accumulated quite a stock of the best types, and a dealer in Deland, Florida, made an arrangement to grow them on and introduce them. This was about the time of the Florida "boom" which drew men from all trades into the real estate business. The dealer suddenly left his bulb business and after they had been growing on for another year in Deland I went over to investigate the situation. I found the bulb man's foreman had let them become crowded with grass and eventually all I obtained from the lot was half a bushel of the bulbs out of the 2½ bushels I had supplied in the first place. This discouraged me in any future attempts to introduce the types I had originated.

Among the species I used in crosses, the most interesting results were obtained from *Gladiolus quartinianus*, a vigorous, blood-red species from tropical Africa. This species has too long a growing season, I understand, to make it practical for growing outdoors in the northern states, and I hoped to develop a strain of gladiolus suited especially to the Florida climate and similar sub-tropical areas. I have a number of these types still growing in my garden and have distributed bulbs to friends for trial. The hybrids are quite distinct. I consider gladiolus breeding as perfectly feasible in the Florida climate and having the possibility of producing some wonderful things, because of our excellent growing conditions and long season.

The humming birds gave me trouble in hybridizing gladiolus. There were hundreds of them around the flowers in the evenings and I could not see that they missed poking their way into a single bloom. Outside of bagging the individual blooms I found it was necessary to make the crosses very promptly, as soon as the pollen and pistil were ready for effective hybridization.

I obtained numerous shipments of cactus seed from Germany during the early years of the century. I have always had an admiration for this group of plants and have trained them in the trees and let them climb over palms and shrubs around my house. I can report a few hybridizing attempts, at least three of which were successful and resulted in important hybrids. I crossed a *Schlumbergera* species on a *Zygocactus*, and also produced another hybrid in the *Phyllocactus* group, crossing *P. latifrons* on *P. phyllanthus*. One of the most interesting hybrids was a bi-generic one between a pink-flowered *Zygocactus* or Christmas cactus, with short flat pads, and the well known climbing cactus, *Cereus boeckmannii*, sometimes classed as a *Selenicereus*, which is white-flowered and is native to south Florida and the West Indies. This cross gave a plant similar to the *Cereus boeckmannii* in character of form and growth, but with delicate pink flowers. The hybrid is not nearly as large as the "*Boeckmannii*" parent, however, having much more slender proportions. It has bloomed once for me.

I have performed numerous experiments in the grafting of cactus, both in the greenhouse and under open air conditions.

WORK WITH BROMELIADS AND CALADIUMS

The Bromeliads interested me greatly and over a period of years I introduced many representatives of several genera, viz., *Aecmea*, *Ananassa*, *Billbergia*, *Cryptanthus*, *Guzmania*, *Hohenbergia*, *Nidularium*, and *Tillandsia*. Work with these gave many interesting crosses of rare beauty in leaf forms and markings and in their gorgeous flower spikes.

Caladiums, because of their lush growth, tropical appearance, and the gay colorings of many forms, have always been favorites. I crossed *C. albanense*, a small thick leaved species with two other nearly plain leaved sorts from Sanders & Co. These hybrids again were crossed with Brazilian varieties resulting in a race with leaves of a different shape which I named "Arrow and Lance". The extreme variation in these was shown by some having nicely variegated leaves three quarters of an inch wide and a foot or more in length. Nearly all seedlings could be recognized as belonging to one or the other of the two races, no matter what the parentage. Unfortunately these new forms have never made much impression on the trade.

The list of sub-tropical plants, bulbs, trees, palms and shrubs that I have imported, introduced, grown from seed, experimented with, or otherwise had in cultivation during the more than 50 years of my life in Florida is too long to give even a small part of it here. It would be only rather dry reading, like a nursery catalogue, and the majority of them, while novelties then, are now so common as to arouse little interest in a native of the sub-tropics.

I understand that in some quarters I am credited with introducing the valuable ornamental bush, *Carissa grandiflora*, which has handsome edible fruits, into Florida in the 80's. Perhaps this may be so, but I have no record of it, although I was importing hundreds of packages of plants, seeds and bulbs every year in those days. I rather think, in the case of carissa, I obtained it from some northern greenhouse or firm specializing in hot-house exotics. I used to buy every sort of plant or bulb that was offered in the northern catalogues as suitable for the sub-tropics. Many of them I lost, from freezes, insects, animals, storms, droughts, and even from human thievery. Many others have now become commonplace things in our Florida life. For instance, I imported many nerines from various sources, and those that survived did well under our climate until one night they were stolen in entirety and I never saw them again. I imported a bulb of the rare *Ismene* type of yellow *Hymenocallis*, known as *H. Amancaes*, from Haage & Schmidt, at Erfurt, Germany, one of the rarest bulbs known, only to have one of our huge Florida grasshoppers devour it entirely as it hung curing in my bulb house. I never had the temerity to attempt its introduction into Florida again, and so far as I know it is still non-existent here. From the firm of Benary, also at Erfurt, I obtained many of my rare plants. In those early days there was no difficult matter of quarantines to bother the importer of bulbs and plants.

In the fifth issue of the Florida State Horticultural Society there are three pages containing my report as to Ornamental Plants. May 1892, two pages in 1910, in 1897 a paper on orchids, 12 pages, 38 to 50.

L'ENVOI

In 1927 came the end of forty-five years of loving companionship with my wife. The doctors said it was cerebral hemorrhage but she knew what was coming and the last thought was for me as she said lovingly "I am sorry to have to leave you this way, Teddy".

As I look back on four score years, the retrospect seems chiefly jewelled with happy friendships for young and old in all parts of the world. The things of the heart are the permanent ones in my life and nearest to what we creatures of a day may dream of as immortality.

Loving labor is never quite lost though sometimes results may seem almost infinitesimal but I feel that warm friends in Florida and elsewhere are ever ready to carry on.

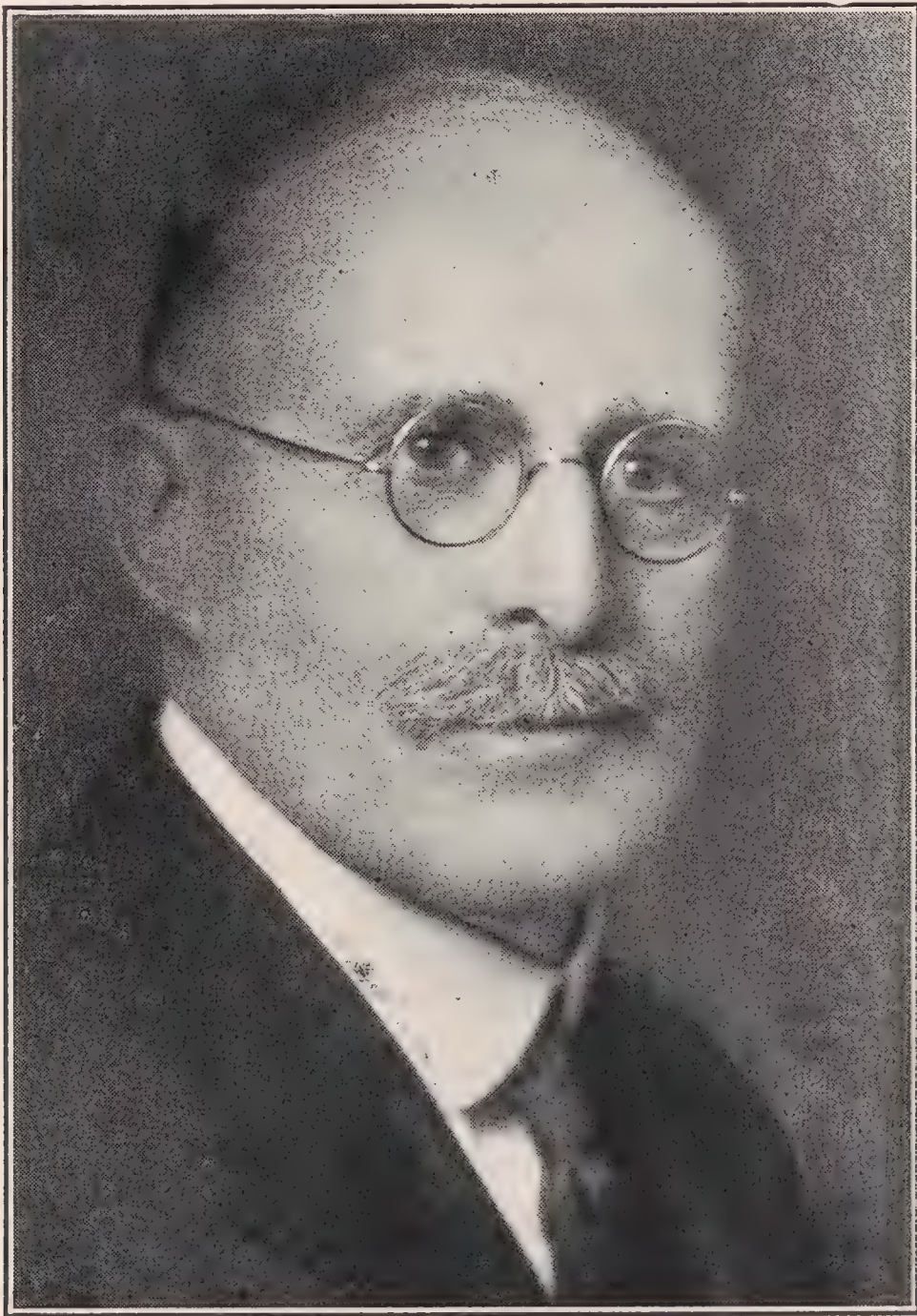
Dr. David Griffiths*

WM. A. TAYLOR,

Bureau of Plant Industry, U. S. Dept. of Agric.

BORN at Aberystwith, Wales, on August 16, 1867, son of David and Rachel (Lewis) Griffiths, he died at Emergency Hospital, in Washington, D. C., on March 19, 1935.

He came to the United States with the family when about three years of age, settling on a farm in South Dakota, his early education being in the local schools, including Groton, S. Dak., Academy and Aberdeen, S. Dak., High School. Having taken a general scientific course, majoring in botany, he was graduated from the South Dakota Agricultural College in 1892, receiving his M.S. in 1893. During his attendance in college he taught school in winters, and from 1893 to 1898 taught



Harris & Ewing

Dr. David Griffiths

biology, physics and chemistry in the Aberdeen, S. Dak., High School. Specializing in botany and zoology at Columbia University, he received his Ph.D. in 1900. At this time he was interested in the study of fungi, publishing contributions on powdery mildews, smuts, ergots and others in *Asa Gray Bulletin*, *Torrey Botanical Club Bulletin* and elsewhere.

He was professor of botany and botanist of the Experiment Station of the University of Arizona in 1900-01, there beginning the studies of grasses and other

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range plants and range management which continued through the first fifteen years of his service in the Federal Bureau of Plant Industry, which he entered in 1901 as expert in charge of field management in the Office of Grass and Forage Plant Investigations. This work involved extensive travel and field studies of native pasture grasses, salt bushes and cacti, from the Canadian border southward well into Mexico. These studies resulted in numerous department publications in which, along with other conclusions of scientific interest and practical importance, the imperative necessity for avoidance of overstocking the ranges with resultant depletion of plant cover and destructive erosion was emphasized. In these studies he became impressed with the economic importance of the cacti as forage plants, and through utilization of native stands and experimental plantings in Texas and California established the usefulness of some of these as emergency forage reserves to tide over drouth shortages. His published results of experiments with "spineless" prickly pear constituted the most important stabilizing factor during the extravagantly optimistic exploitation of this plant which occurred during the first decade of the present century, and served effectively to warn the public against the indiscriminate extensive planting of the spineless forms in climates to which they are not adopted because of their susceptibility to injury by cold.

Appreciating the possibilities of cacti as ornamental plants, he early assembled a comprehensive collection of species and varieties at the Plant Introduction Garden at Chico, Calif., which afforded material for the preparation of a fine collection of colored illustrations, unfortunately as yet unpublished. Close to 3,500 numbers of *Opuntia* were included in the Chico collection. From these experimental studies of the cacti resulted a steady flow of papers on taxonomic, agronomic and horticultural phases, published by the Department of Agriculture, the Missouri Botanical Garden, with which close cooperation existed, and in various scientific and popular journals from 1905 to about 1920. These materially enlarged available knowledge of cacti and were of particular importance because of their timeliness in relation to the development of the wide-spread and intensive interest in them as agricultural and horticultural plants.

His steadily increasing interest in the horticultural field resulted in his eventual assignment to the bulb production project of the Bureau of Plant Industry, to which approximately his last twenty years were devoted. Some preliminary experimentation in the commercial production of Dutch bulbs, in distinction from the flowering of the imported bulbs both out of doors and under glass, had previously been done, with results which indicated probabilities of developing satisfactory production of some species. Economic conditions differed so widely from those in the European countries from which the imported supply came, and the lack of training and experience in the art of bulb growing among American growers was so obvious that the pioneering of the industry along lines technically efficient and economically sound was a difficult undertaking. Though the funds available were woefully inadequate for the purpose, Dr. Griffiths entered the field with such enthusiasm of spirit and tenacity of purpose, and so promptly devised scientifically sound and practical methods of procedure that he soon became recognized as the unquestioned leader in this field. Maintaining experimental plots and to some extent variety collections at Arlington Farm, Va., Bellingham, Wash., Willard, N. C., and cooperative tests with interested amateurs and commercial growers in many sections, his leadership was largely responsible for the progress thus far made in commercial bulb production in the United States.

Even as senior horticulturist much of his field work was of necessity done with his own hands, frequently under weather and soil conditions which involved physical hardship and hazard to health which would have discouraged one less resolutely persistent and determined to carry through the undertaking. His sustained enthusiasm and courage under such conditions inspired loyalty in his assistants and encouraged them to do their very best.

Dr. Griffiths' most extensive and immediately important bulb work from the economic standpoint dealt with the devising of practical methods of growing and handling the bulbs of narcissi, tulip, hyacinth, as well as Easter, Madonna, Henry. Speciosum and Tiger lilies and other already widely grown and extensively imported Dutch bulbs, upon most of which he published extensively and usefully through the Department of Agriculture. He was at the same time intensively interested in the newer and less well-known bulbous plants, notably the Regal, Nankeen and other

foreign lilies, and especially in such potentially important lilies as the Leopard, Lemon, Humboldt, Columbia, Martagon, Turk's-cap, Canada and other native species. He worked out and published practical methods of propagation of these and many other bulbous plants. Determination of the economic value of the American grown bulbs in contrast with the imported product necessitated intensive experimentation in their curing, transporting and storing, and especially the effects of storage temperatures upon their reaction to the forcing house conditions under which they are extensively utilized by florists. He had much hybridization of bulbous plants under way, particularly lilies and daffodils and had named and described a considerable number of promising new varieties, some of which are in process of dissemination.

His technical articles on bulb subjects, which comprise many papers in the proceedings of scientific societies and bulletins of the department, were effectively supplemented by a steady flow of less formal articles addressed mainly to a rapidly increasing audience of actual and potential bulb growers who could best be reached through such representative horticultural trade periodicals as *Florists' Exchange*, *Florists' Review*, *Seed World*, etc., in which more than one hundred articles were published. His crisp and lucid style of presentation added greatly to the practical value of these communications, for he possessed in marked degree that informal clarity of expression which while sometimes vexatious to editors is the joy and satisfaction of the lay reader.

Reared, and in the main schooled, close to the agricultural frontier of that time Dr. Griffiths developed a rare combination of scientific accuracy in his research, and sound common sense in the practical application of his discoveries. Indefatigably industrious and efficient, the work which progressively he undertook on fungi, grasses, cacti and bulbs he put his whole soul into.

Dr. Griffiths married Miss Emigene Lily in 1905, who died in 1909. A daughter, Mrs. Elizabeth Griffiths Lash, and a son, John D. Griffiths, survive, together with his widow, Mrs. Louise Hayward Griffiths, a sister and a brother.

Dr. Stout's "Daylilies"

"DAYLILIES" by A. B. Stout, Ph.D., subtitled "The Wild Species and Garden Clones, Both Old and New, of the Genus *Hemerocallis*." New York, 1934, The Mac-Millan Company, 119 p., (\$3.00).

Here is the last word, for many years to come, at least, on those popular garden favorites, the Daylilies, which Dr. Hutchinson, the Kew botanist and systematist, now places in such close relationship with the *Amaryllidaceae*.

Dr. Stout, distinguished plantsman, hybridizer, and Director of the Laboratories of the New York Botanical Garden, proves himself an entertaining, painstaking and reliable author in this more or less popular treatment of his subject. The book will be of never failing interest and endless value to the confirmed *Hemerocallis* fancier, and should also produce a host of new converts to this most attractive garden perennial. The technical treatment in the book never becomes downright tedious or dull, and the general material on the history and evolution of Day Lilies, ancient and modern, carrying the annals of these plants from the late Renaissance on through to the new developments of such striking beauty as both Dr. Stout and Mr. Carl Betscher of Dover, Ohio, have produced, makes the reading matter as absorbing as many a novel.

Hemerocallis has a particular appeal to the flower loving world. The flowers are outstandingly beautiful, and yet somewhat ephemeral, hence their name, "lilies for but a day". They are one of the few perennials that thrive from Canada to southern Florida, and while being of reasonable hardiness in the northern states, they bloom earlier in the year and stay nearly evergreen in the sub-tropics.

Dr. Stout is chiefly known in the field of Day Lilies for his five hybrids, "Mikado", "Cinnabar", "Soudan", "Vesta", and "Wau Bun", named varieties of his creation through many generations of crossings, and all regarded as triumphs of the hybridizers art. "Mikado", in fact, is sometimes called the "world's best Day Lily". It is a fine orange with mahogany red-brown blotches which distinguishes it among hundreds of other varieties.

Dr. Stout shows photographs of two other varieties of his hybridizing, "Theron" and "Vulcan", in the book, which are not yet generally distributed, and which every *Hemerocallis* fan will find most captivating.

The author's best results in his hybridizing seem to be the variations in the fulvous or mahogany-red coloring obtained as the results of his crossings of many varieties and species. "Cinnabar", "Theron" and "Vulcan" show this to advantage.

Besides the list of natural species with full descriptions, Dr. Stout provides an invaluable check-list of all named varieties of Day Lilies recorded to the time of publication. This is very complete, and helpful in checking collections and trade lists, besides forming in itself a minor history of the cultivated plant in recent years. A *Hemerocallis* Breeders' "Who's Who" ends the book.

There are chapters on the Botanical Characteristics of Daylilies; Names of Daylilies; The Natural Distribution of Daylilies; Daylilies in Historical Retrospect; Species of Daylilies; The Horticultural Clones of Daylilies; An Evaluation of the Daylilies; The Uses of Daylilies; Culture and Care; and Propagation, Seed Production and Breeding.

The excellent illustrations, some of them in color, help to make the volume more important to the plant enthusiast and breeder. The book is an ornament to any garden lover's library table, and will fill a distinct want which has existed for many years; there having been previously no comprehensive treatment of *Hemerocallis*.

Besides Dr. Stout, perhaps the leading *Hemerocallis* breeder in the United States is Mr. Betscher, of Dover, Ohio. A number of his new varieties are described in the checklist of this book, and we wish that Dr. Stout had given us a little more data on the Betscher varieties and breeding history besides the brief note in the Appendix.

The author of "Daylilies" has had the advantage of the purely scientific approach to the study of *Hemerocallis* species and varieties, and the results obtained both in his breeding and the final appearance of this admirable study indicate that the time and money which the research has cost over a number of years have been well spent. His work has brought to our gardens a number of remarkably beautiful Day Lilies, and he has enriched horticultural literature with an interesting and useful treatment of the Genus which leaves us with the hope that even greater things are to be forthcoming before many more years in the field of fine, hybrid *Hemerocallis*.

June 1, 1935
Winter Park, Florida

WYNDHAM HAYWARD

American Daffodil Year Book

The members of the Society are familiar with the valuable Daffodil Year Book issued by the Royal Horticultural Society, London, and we are indeed glad to welcome the American Daffodil Year Book, 1935, published by the American Horticultural Society¹. It appears in practically the same style and format as the four numbers which comprise each volume of the National Horticultural Magazine.

It contains a preface by Mrs. Francis King, an appreciation "To the Daffodil" by Richardson Wright, and 16 articles by competent authorities. This is a genuine contribution to daffodil literature from the American viewpoint.

Mira Flores
Orlando, Fla.

HAMILTON P. TRAUB

¹ American Horticultural Society. The American Daffodil Year Book. 1935.

Greetings to the Members of the American Amaryllis Society

On May 21st, 1933, in the City of Orlando, Florida, four men met by appointment and at the close of the meeting your Society, The American Amaryllis Society, was born.

The four men were Dr. H. P. Traub, Wyndham Hayward, R. W. Wheeler and the writer. In two years the Society has grown from a membership of four to quite a strong healthy child, and while its membership is not the largest, it is of the highest quality and international in scope. To Dr. Traub and Mr. Hayward we are greatly indebted for the Society and its healthy growth, and too much praise and thanks cannot be given them for their unceasing labor in behalf of our Society.

The First National Amaryllis Show was held last year in Orlando, Florida and the second this year in Montebello, California, both of which were a great success, as was also the Southeastern Regional Fiesta held here this year. The United States Department of Agriculture sent very fine flowers to all three shows. I wish that each member could have attended and I feel that each Regional Division should put on a show each year which would stimulate interest in the growing of better amaryllids. The Year Book of the Society has merited the highest praise from everyone interested in the advancement of the amaryllids, and a respectable number of species, new to culture in America, have been introduced.

Your President has grown amaryllids for twenty years or more, not for profit, but for pleasure and the love of the flower. I wish it were possible to meet each member personally and thank each one for the interest shown in the Society. It is hoped that each member will consider him or herself a committee of one to secure at least one new member before January 1936, so that we may start the coming year with a still more prosperous Society.

With the best of wishes for each member, I remain

Yours to command,

June 1, 1935
Orlando, Florida

E. G. DUCKWORTH,
President.

Report of the Secretary

By the time this Year Book reaches the membership, the American Amaryllis Society will be well on its third year of progress. One may well challenge any other plant society to have shown the same degrees of successful achievement in its early stages.

With the cooperation of Year Book advertisers and active members, as well as the distinguished contributors to our publication, our first year was ended with all accounts paid and a small balance left for the 1935 season. The Society has made a name for itself with its first Year Book, under the able editorship of Dr. Hamilton P. Traub of Orlando, Florida, and your Secretary foresees an even better reception for the present number.

The Amaryllids as a class are of so much interest in ornamental horticulture that it now may seem remarkable that no previous organization was formed to study the group. For greenhouse and conservatory as well as the window garden in the north and for general outdoor plantings in warm climates, there is no family of plants having a greater variety of types of culture, colors and shapes of flowers and foliage possessing the most pleasing and decorative qualities imaginable.

In the past year the Society has made valuable new contacts with Amaryllid lovers in East and South Africa, Australia, South America, especially Argentina, England, Germany, Denmark, Holland, Italy and Japan.

Many new friends in the United States have added their sincere enthusiasm to our efforts, and have been kind enough to say that they have found our first publication, the 1934 Year Book, both intensely interesting and distinctly valuable.

In addition to Mr. A. Worsley and Mr. Theodore L. Mead, the Directors have elected as Fellows of the Society: Miss Ida Luyten, of the Laboratory for Plant Physiological Research, Wageningen, Holland, in recognition of her original researches in the vegetative propagation of *Hippeastrum*; Prof. Ferdinand Pax of Breslau, Germany, the venerable botanical systematist and lifelong student of the *Amaryllidaceae*, in recognition of his work in this field; Dr. J. Hutchinson, of Kew Gardens, England, for his progressive and inspiring revision of the *Amaryllidaceae*.

Since the publication of the 1934 Year Book the Society has held three Amaryllis exhibitions, two of them National Shows and all of them most successful. Full accounts are available elsewhere. Flower lovers have thus been enabled to view the hybrid Amaryllis and allied types at their best, and the message of beauty inherent in this royal family has been carried by direct visual means to thousands of people.

The Secretary has written more than 2,500 letters, supplying information, circulars, and other material in the last two years and a half, and does not regret this expense of time and effort. The Society's business is already of considerable scope and the volume of correspondence compels recourse to nearly-forgotten training in varied linguistics. It is not unusual to receive letters in Italian, German, French, Spanish and Portuguese, not to mention Dutch, English and French in the same week.

Scientific, botanical and horticultural journals throughout the world accorded our 1934 Year Book a very friendly and favorable reception. There seems to be a very decided rising tide of interest in the Amaryllids and the Society hopes it may fill a real place in supplying accurate information.

The appeal of the Amaryllis is to all walks of life, the learned and the amateur gardener. The letters from members to the secretary indicate clearly the genuine feeling for the Amaryllids that has such a strong hold on nature lovers all over the world whenever they come into contact with them. How many times have I read various versions of the line "I fell in love with the Amaryllids the first time I saw a gorgeous hybrid Amaryllis in bloom"!

Some have a strong leaning toward the dainty *Zephyranthes*, others like the more robust crinums, some are fascinated by the graceful nerines, *Hymenocallis* or *Lycoris*; a few prefer the native species as they grow in the wilds. Many are working zealously to improve on nature's work with the magic of the hybridizer's art.

A large number of the genera are still neglected, despite their interest and value. These include *Haemanthus*, nerines, more or less, and *Lycoris*, *Vallota*, *Pancratium*, *Buphane*, *Crytanthus*, *Brunsvigia*, *Calostemma* and *Eurycles*. Let us hope these will become more readily available to plant lovers for trial in the future. Many other genera remain practically unknown.

The Society has sponsored and encouraged the commercial growers in efforts to introduce named varieties of hybrid Amaryllis, nerines, etc., believing that still greater popularity will come from the availability of standard varieties of the bulbs, so that a customer may know in advance what he or she is getting, as prevails already in the case of peonies, iris, gladioli, etc. Research has been undertaken by members on the thorny subjects of forcing, curing and storing amaryllis bulbs.

If the depression has proved anything, it has shown the value to the commercial grower of quality stock over an unknown mixture of orphaned origin, every time. There have never been too many high quality hybrid amaryllis, nerines, etc.

Personal acknowledgements of all the favors and assistance received, the cooperation freely given and the information gladly supplied would fill many pages but the secretary cannot let slide the opportunity of mentioning a few of the names of persons and organizations to whom he is in some way indebted,—President E. G. Duckworth, who has proved himself a worthy head of a worth-while organization; Vice President, Dr. H. P. Traub, the never-tiring editor and patient worker in pure and applied science; Theodore L. Mead, Lord Aberconway, Harry L. Stinson, Basil N. Ikeda, Mrs. John H. Churchwell, Richard Diener, Al. G. Ulrich, Mrs. William Lyman Carter, the late Dr. David Griffiths, W. L. Fulmer, Mrs. Frank Joyce, D. C. Royer, Pierre S. duPont, W. A. Percy, I. W. Heaton, E. H. Krelage, C. W. Hall, Frank Vasku, C. G. van Tubergen, Ltd., E. P. Zimmerman, Cecil H. Houdyshel, Fred Howard, J. Wise Byrnes, A. Worsley, George W. Mitchell, R. E. Morrison, Arthur R. King, Mrs. B. A. Dominick, Rev. J. W. Ischy, Russell S. Wolfe, Arno H. Nehrling, A. C. Splinter, John R. Springer, Dr. S. C. Harland, E. O. Orpet, Alexander Steffen, Mrs. Emma M. Foster, William T. Walke, Robert F. Ruthruff, The Massachusetts

Horticultural Society, the New York Botanical Garden, Kew Gardens, Jose F. Molfino, Camillo Schneider, Miss Ida Luyten, and Treasurer R. W. Wheeler.

These are just a few of the "most active" members and cooperators who have assisted the secretary in his efforts. There are many others equally as deserving of mention, but lack of space forbids.

In the year to come the Society hopes to continue its work of introducing promising species for the gardener and hybridizer. It will hold its third annual National Amaryllis Show in central Florida, some time between March 15 and April 15, 1936. The Secretary will endeavor to answer all his mail promptly as long as the "Royal" and his two good forefingers hold out. Members near and far are urged to write of their experiences and problems in connection with Amaryllid culture, and last but not least, pay their dues early in the year. It takes money to publish a Year Book, and the information in a single issue is worth many times the cost of an annual subscription, \$2.00. The more memberships we receive, the better Year Book we can put out. A membership with its accompanying Year Book would be a most suitable birthday or Christmas gift to a plant-loving friend, and it is to be hoped that many of the friends of the Society will take advantage of this idea. Tell your friends of the Society's work.

In the future issues of the Year Book we want to publish more illustrations of fine specimen plants, perhaps even a color plate or so. Any special donation for this purpose will be most sincerely welcomed.

The Secretary acknowledges with thanks the receipt from Prof. F. Pax of a "separate" of his monograph on the *Amaryllidaceae* which appeared in 1930 as a part of Vol. 15 of the great Engler and Prantl "Pflanzenfamilien". Dr. Pax and K. Hoffman collaborated on the monograph. Under date of Dec. 2, 1934, Dr. Pax wrote: "The *Liliaceae* and *Amaryllidaceae* are very closely related, as I stress in the introduction to both families in the publication. The *Agaveae* and *Hypoxideae*, *Alstroemeriaceae*, as well as the *Conostylideae* are a little more removed from the typical *Amaryllidaceae* and therefore are treated by me as sub-families. The *Velloziaceae* are treated by me in the "Pflanzenfamilien" as a special family. The *Agapantheae*, *Alliae*, *Gillesiae*, which are included in the *Amaryllidaceae* by Dr. J. Hutchinson, I should prefer to leave among the "*Liliaceae*."

Special mention should be made of the assistance of two members of the faculty of Rollins College, Winter Park, Florida, in some of the problems coming to the attention of the secretary during the last two years, Dr. Richard Feuerstein of the Department of Modern Languages, and Prof. J. C. Th. Uphof, of the Department of Botany, an internationally known scientist in his field.

Your editor-in-chief, Dr. Traub, is too modest to say anything about it, but he is attempting a marvelous naturalistic landscaping of his new country estate near Orlando, Florida, "Mira Flores", which bids fair to rival the efforts of the English specialists in this line. Bulbs of the Amaryllis family will form the keynote of his scheme, and I suppose, in ten years or so the outcome will be a new revision of the *Amaryllidaceae*, based on modern phylogenetic principles and observations of the living plants under all conditions. Your Secretary humbly suggests that interested members of the Society communicate with him direct if they have any spare material of rare species available for exchange in the cause of science.

The best bit of humor of the year was the plight of a member who bought a volume entitled "Amarilis" through his bookseller, after much searching, only to find it was a short novel of artist life in a California coast city.

So now, *vale atque vale* until another twelvemonth, and I close with three lines from Spencer's "Colin Clout's Come Home Again" (1596)

"No less praiseworthy are the sisters three.....
Phyllis, Charyllis and sweet Amaryllis.....
But Amaryllis highest in degree."

Winter Park, Florida
June 3, 1935.

WYNDHAM HAYWARD,
Secretary.

Report of Trial Collections Committee

The Trial Collections Committee of the American Amaryllis Society reports the receipt of the following material during the period of 1934-35, to the time of publication of the Year Book. Contributions have been in the form of seeds and bulbs which will be grown under careful supervision with the aim of eventual distribution to interested members when sufficient supplies are available.

The catalogue follows:

No. 1, *Zephyranthes Ajax*, handsome variety with straw-colored flowers, and round, rush-like foliage. Reported to be a hybrid between *Z.candida* and *Z.aurea*, or between *Z.candida* and *Z.citrina*. Packet of seed received from James L. Gebert, New Iberia, Louisiana.

No. 2, *Hippeastrum* species or variety, received from Robert D. Mitchell, Orlando, Florida; possibly *Hippeastrum solandriflorum*, var. *conspicuum*. Vigorous red-flowered type similar to what is in the trade as *H. Johnsonii*.

No. 3, *Hippeastrum equestre*, var. *major*, collected in old Florida gardens. Fine species, of earliest culture, with free blooming habit in spring. Bright orange-red blooms with yellowish throat, fast multiplier and thrives under poor soil conditions in Florida. Donated by I. W. Heaton.

No. 4, *Crinum americanum*, collected in swamps of central Florida, by Dr. Hamilton P. Traub. Fine white-flowered species, very difficult to bloom in cultivation. A real aquatic plant.

No. 5, *Crinum* species, possibly *C.zeylanicum* or *C.sanderianum*, collected in old Florida gardens by Wyndham Hayward. Handsome reddish-pink and white flowers. Vigorous summer bloomer.

No. 6, *Hymenocallis* species, from old Florida gardens, possibly *H.keyensis* (*caribaea*). Large white sweet-scented blooms. Flowers in summer. Donated by Wyndham Hayward.

No. 7, *Hymenocallis* species, possibly *H.rotata*, from swamps of eastern Orange county, Florida. Dainty white flowers. Aquatic plant. Collected by Dr. H. P. Traub and Wyndham Hayward.

No. 8, *Hippeastrum rutilum fulgidum*, red-flowered species, received from James L. Gebert.

No. 9, *Cooperia drummondii*, Texas Rain Lily, pinkish white flowers, after the summer rains. Seed received from James L. Gebert, New Iberia, La.

No. 10, *Zephyranthes robusta*, free-flowering pink and white species with glaucous foliage. One of the best of the genus. Easy culture. Donated by Wyndham Hayward.

No. 11, *Haemanthus coccineus*, rare South African "Blood Lily". Seed received from E. O. Orpet, Santa Barbara, Calif.

No. 12, *Zephyranthes rosea*, dainty rose-colored flowers with flat leaves. Smaller than *carinata*. One of the most beautiful species. Donated by Dr. Hamilton P. Traub.

No. 13, *Crinum* species, unknown, from British Guiana, contributed by Windham Hayward.

Nos. 14 and 15, *Hippeastrum* species, unknown, from British Guiana, donated by Wyndham Hayward.

No. 16, *Hippeastrum* species, Habranthus type, pink flowers, contributed by Rev. C. W. Hall, Austin, Texas.

No. 17, *Haemanthus multiflorus* (?) bulb cuttings, contributed by R. E. Morrison, Tavares, Florida. Handsome species of South and Central African "Blood Lily", with globular heads of fine scarlet blooms in an umbel 9 inches in diameter. Bulb is dormant in winter. Naturalizes in Florida.

No. 18, *Amaryllis belladonna* variety, received from E. O. Orpet.

No. 19, *Crinum scabrum*, fine red and white flowered species. Sets seed freely. Contributed by T. L. Mead of Oviedo, Florida.

No. 20, *Hieronymiella clidanthoides*, interesting and rare amaryllid from Argentina; seed received from Sr. Alberto Castellanos, Buenos Aires, Argentina. Bulb with white flowers.

No. 21, *Hippeastrum* species, seed received from Sr. Alberto Castellanos, Buenos Aires, Argentina; Possibly *H.ambiguum*.

No. 22, *Zephyranthes* species, bulbs collected as *Z. caerulea* in Entre Rios Province, Argentina, by Sr. J. R. Baez, for Sr. Jose F. Molfino, of Botanical Laboratory, Argentine Ministry of Agriculture. Received from Sr. Molfino, (10 bulbs in all, seven of which proved to be corms of *Calydorea campestris* (Klatt) Baker. This is a rare South American irid.) The first of the three remaining true *Zephyranthes* bulbs bloomed *white* in spring, 1935, indicating it was not *Z. caerulea*, which had been offered members of the Society, when available, in the 1935 membership circular. *Z. caerulea* is reported to have "pale blue" flowers. New attempts to import the true *Z. caerulea* are being made with the cooperation of Argentine officials.

No. 23, *Zephyranthes treatiae*, native Florida species, of difficult culture, received from Mrs. W. A. MacArthur of Jacksonville, Florida.

No. 24, *Zephyranthes texana*, received from H. B. Parks, San Antonio, Texas. Excellent small yellow flowered species native to Texas.

No. 25, *Zephyranthes longifolia*, bulbs received from H. B. Parks, San Antonio, Texas, and also from H. Harold Hume, Gainesville, Florida. Handsome yellow-flowered species, native of Texas and New Mexico. Found growing in highly calcareous land.

No. 26, *Hymenocallis* Sulphur Queen (Ismene group) yellow flowered Ismene, of easy growth, a hybrid originated in England as a cross between *H. calathina* and the rare yellow flowered species, *H. amancaes*. Bloom similar to Ismene, with slightly larger cup. Delicate yellow coloring with greenish throat. Contributed by Dr. Hamilton P. Traub.

No. 27, *Zephyranthes atamasco*, bulbs contributed by Russell S. Wolfe, Orangeburg, S. C.; native species of difficult culture.

No. 28, *Zephyranthes carinata*, received from Russell S. Wolfe, Orangeburg, S. C. The usual large pink "Fairy Lily".

No. 29, *Nerine sarniensis*, the Guernsey Lily. Contributed by Wyndham Hayward. Scarlet flowers, spidery in form, blooming in late summer after foliage has died down.

No. 30, *Crinum parvum*, seeds received from The Lady Muriel Jex-Blake, of Nairobi, Kenya Colony, East Africa, in February, 1935, and fair germination obtained. Strong possibility of important future for this species as an ornamental house or conservatory pot plant exists because of its small size and handsome flower and foliage. Lady Muriel writes that it is "small but charming". The small size of this plant may serve to make this species popular with flower lovers who have found the usual run of crinums too large and awkward for ordinary culture. It is reported to be the smallest crinum known.

No. 31, *Hippeastrum equestre* bulbs contributed by Hon. E. B. Martyn, Govt. Botanist, Georgetown, British Guiana.

WYNDHAM HAYWARD,
Chairman.

Winter Park, Florida,
July 1, 1935.

The Secretary's Mail Bag

The Dominion Government greenhouses at Ottawa, Canada, can show some large-flowered hybrid amaryllis. Photographs of some of the choice blooms which were submitted to President E. G. Duckworth of the A. A. S. show numbers of unusually large flowers, one of them described as being 13 inches across. One of the California growers claims to have them up to 16 inches. That must mean a long "duck bill", which is what the Florida growers call an extended narrow lower petal on a hybrid bloom. Twelve-inch blooms are reported from the collection of the Bureau of Plant Industry, U. S. D. A., at Washington, D. C., but 8 to 10 inches remains a very large bloom in Florida plantings.

Many amateur growers call special attention to the number of blooms in the umbel on a single scape of their amaryllis, when this exceeds four, which is the usual number for a well-bred bulb. Occasionally six, seven or even eight blooms on a

spike are to be seen, and the writer has seen one instance of nine. However, a little study soon convinces the flower lover that more than four is little but an oddity, and six becomes usually grotesque.

One of the most distinguished new members that our Society has enrolled this year is Major Albert Pam, O. B. E., of England. Major Pam is a dyed-in-the-wool follower of Dean Herbert, a genuine amaryllis fan, as we would say in America. He writes under date of June 14: "I shall be very pleased to cooperate with your Society in any way possible, as I have a good collection of Amaryllidaceae from all parts of the world, but especially from South America. I could often send you seeds of species which have flowered with me and sometimes even bulbs" The foregoing speaks for itself and the Society extends to Major Pam its sincere appreciation for his willingness to cooperate with us so whole-heartedly.

The recently discovered South American Amaryllid, *Pamianthe peruviana*, was named after Major Pam, who imported the bulbs from Peru several years ago. This plant is close to *Hymenocallis* (*Ismene*) and is illustrated in this Year Book. Dr. Stapf described this plant in the Botanic Magazine. Major Pam writes: "It is a marvelous plant with very large strongly scented flowers the only trouble with this plant is that the seeds remain fertile for but a few days, and I very much fear that if I sent them to you even by post they would not germinate readily after a transit of a week. However, it might be better if I could send you a complete seed pod as soon as I notice the first crack in the pod while it is attached to the plant. Then I believe the seeds would probably retain their fertility and would germinate readily."

Major Pam informs us he will "have at least 100 of these plants (*Pamianthe peruviana*) in flower in February and March next, but the seed pod takes 12 months to ripen, and I should therefore not be able to send it to you for distribution until early in 1937. The plants raised from seed will flower in 3 or 4 years."

Readers are advised not to miss the 1936 Year Book, with its Autobiography of Mr. A. Worsley, Dean of the Amaryllis fraternity in England. Although now past 70 years and not so actively engaged in the field, he still retains his sincere interest and enthusiasm. It is the story of the life and career of an English gentleman, a scholar, an eminent horticulturist, and a keen-minded business man with far-flung interests.

All members are invited to contribute plant material to the Trial Gardens Collection of the Society. When sufficient material becomes available it is intended to place the collection in the care of a scientific institution, a college horticultural department, or a municipal park board, for purposes of permanent preservation, with the Society having full rights to the distribution of seeds and natural increase of the bulbs.

The New York Botanical Garden, by action of the Board of Directors of the A. A. S., has been appointed an official cooperator of the Society in the study and identification of rare and unknown plants of the Amaryllis Family, with the aim of ultimately making accurately listed specimens available, through increase, to interested members. Persons having rare or unidentified bulbs of the Amaryllis family may send them to the New York Botanical Garden, Bronx Park, N. Y., in the name of the Society or to the Chairman of the Trial Collections Committee.

This is the intriguing description of the diminutive *Crinum parvum* which the Lady Muriel Jex-Blake of Nairobi, Kenya Colony, East Africa, helped the Society to introduce this year, (The words are Lady Muriel's) "The bulb is small, as crinums go, a little larger than a very big daffodil bulb; leaves perhaps half inch wide, to three-quarters of an inch, and 18 inches long. They rather lie on the ground, or at least are upright for a very short way, and then turn over. They come alternately from the bulb, with an effect of 'plaiting' which is attractive. The flowers are on

short, moderately thick stems, and about 4 to 6 scented white flowers, turning pink with age. These flowers are from two to three inches long, quite small, more the shape of a cyrtanthus flower,—long, narrow and tubular, but very charming. The bulbs establish themselves quickly, and then flower frequently through the year". The above is dated May 29, 1935 at Nairobi. This does not exactly coincide with the official description of the "*Crinum (Codonocrinum) parvum*, Baker, (Amaryllideae-Amaryllleae) ex affinitate *X. pauciflori*, Baker", as kindly furnished by Dr. A. D. Cotton, Keeper of the Herbarium at the Royal Botanic Gardens, Kew. It may be an entirely new species.

By announcement of Dr. Lee A. Strong, Chief of the Bureau of Entomology and Plant Quarantine, U. S. D. A., previous restrictions against the wholesale entry of narcissus bulbs, including daffodils, paper whites, etc., into the United States, will be lifted December 15, 1936. After this date the bulbs will be admitted from abroad under Regulation No. 3 of the Nursery Stock, Plant and Seed Quarantine No. 37, without limitation as to quantity and utilization. This change of policy by the Bureau, on grounds that the pests on which the old quarantine restrictions were based have become so widespread that nothing is served by keeping out the bulbs any more, has aroused considerable discussion pro and con among the amateur narcissus fans, professional growers, dealers, etc. Increased tariff protection to safeguard in some degree the investments of American narcissus growers has been proposed as a partial solution of the problem.

Amaryllis fanciers should not neglect the little orange-flowered *Hippeastrum equestre major*, just because the bulbs are common, and quite inexpensive. It takes the place of tulips in Florida gardens in the spring, and blooms unfailingly, unless given too much attention. It makes the best bulbs if left alone in sandy soil and also blooms well in such a location. If fertilized heavily, it seems to put its efforts into forming offsets, and may forget to bloom at all. It is probably without doubt the most prolific of *Hippeastrums*. It is very difficult to set seed on a *Hippeastrum equestre major*, with its own pollen or with pollen from hybrid amaryllis. Out of more than 100 crosses in one experiment, less than a dozen seed have been obtained. It is apparently useful in crossing on the hybrids, however, and in this way the salmon and orange shades may be introduced. A yellow shade might well be derived from this species, as it has a distinct yellow throat.

Crinum giganteum is an important and distinct white, winter-blooming type, for outdoors in warm climates. It likes a little shade, but will do well in the sun with rich soil underneath. It produces magnificent umbels of white cup-shaped blooms, even in January, which are often used by gardeners, to replace lilies at that time of the year when occasional white blooms are wanted in planting effects.

Pancratium maritimum is an easy seeder. It is an interesting plant for the sub-tropical garden, and the greenhouse. It blooms in Florida mostly in late May and June, just as the foliage dies down. The foliage makes its growth during the winter months, and is of a handsome glaucous green shade. The bloom is similar to a glorified *Hymenocallis* with a handsome serrate-edged cup, as in the daffodil. The color is white, and the bloom has a delicate perfume.

Lovers of the narcissi should not fail to try other varieties of this bulb in the winter-flowering section, than the usual "Paper White" and "Grand Soleil d'Or." Several other types are available in the trade.

Pure whites in hybrid amaryllis (with no markings of any other color, except light green in the throat) are known in quantity in Europe in the trade, having been reported from England, Holland and Germany. The United States Department of Agriculture has developed a small stock of the pure whites, in the Bureau of Plant Industry greenhouses at Washington, D. C. It is expected that the bulbs will be offered at reasonable prices in the United States before many years, in quantity. At this time they are largely in the hands of private collectors and fanciers. The average price for good specimens in Holland and England is about \$5.00 each. In the United States they have been offered for \$10.00 each. The flowers usually have a light greenish throat, which some growers believe sets off the crystal purity of the petals to better advantage.

All efforts to obtain the rare yellow-flowered species, *Hippeastrum rutilum citrinum*, reported as native to Brazil, and illustrated in color in Mrs. Bury's great monograph on Hexandrian Plants a hundred years ago, have been unsuccessful to date. One member, Mr. Pierre S. du Pont, reports receipt of a supposed specimen of the bulb, which bloomed a brownish color to his disappointment.

No one seems to know just what species of crinum is the one called "Milk and Wine Lily", and found growing in great clumps or rows around old homesteads in the deep South. It probably includes one or more of the following kinds: *Crinum zeylanicum*, *C. kirkii*, *C. fimbriatulum*, *C. erubescens*, or *C. sanderianum*.

A European horticultural agent has offered American collectors part of a collection of new hybrid nerines developed by the late Florentine naturalist and plantsman, Dr. Attilio Ragionieri. These are said to be exceptional, for their late-blooming habits, some of them offering the possibility of being actual winter-blooming types, with their flowering period as late as December.

"Attilio Ragionieri—Medico-Naturalista—(1856-1933)" is the title of an interesting brochure issued by the family of the noted Italian hybridizer who received first recognition for a *Crinum moorei-amaryllis belladonna* hybrid, and who died in October, 1933. The brochure contains reprints of various eulogies and obituary notices with interesting biographical details of his plant achievements, published in Italian, English, American and German magazines, among others. A copy of this brochure was presented to the American Amaryllis Society by the Ragionieri family.

Hybrid Amaryllis—"Due to ease of culture, and wide range of colors, the hybrid forms are very suitable for commercial culture, either as pot plants or for cut flowers." This is the comment by Messrs. Alex Laurie and L. C. Chadwick, Ohio State University authorities on floriculture, in their new and admirable work, "Commercial Flower Forcing", which has rapidly taken foremost rank among books for the professional greenhouse grower. The book is published by P. Blakiston's Son & Co., Inc., Philadelphia, Pa. It has much of value for the flower and bulb gardener wherever he may be. The quotation brings up a fine point about hybrid amaryllis, its use and place as a cut flower. Unfortunately, hybrid amaryllis are unjustly neglected by the American florist, and the use of the blooms in cut flower work is almost unknown.

I. W. Heaton, as designer, was awarded second prize ribbon for a basket arrangement of hybrid Amaryllis blooms, exemplifying the use of this flower in floral design work at the 1934 Spring Flower Show, of the Orlando, Florida Garden Club Circles. His entry was in competition with Watsonias, Gladiolus and Snapdragons.

Class No. 15 of "Foliage and Flowering Plants", open to amateur and professional competition, will be for "Nerines, collection to cover 50 square feet, decorative foliage plants permitted", at the 28th Annual Autumn Exhibition of The Horticultural Society of New York, which will be held in the American Museum of Natural History, 77th Street and Central Park West, New York City, on November 7 to 10 inclusive, 1935. There are two cash prizes offered in this class, \$50.00 and \$30.00, for first and second places respectively. Members of the Society are invited to view this class at the New York Fall Show if they are interested in the finest developments in nerine hybrids. The show is otherwise devoted mainly to chrysanthemums. Mr. Henry F. du Pont, a member of our Society, is president of The Horticultural Society of New York. The du Pont family is outstanding in America for its interest in hybrid amaryllis and allied bulbs.

Two of the best trade catalogues devoted to amaryllids and also many other bulbs, that have come to the attention of members of the Society, are those of Philip Montague, Humphries road, Frankstown, Victoria, Australia, and C. G. van Tubergen, Ltd., Zwanenburg Nurseries, Haarlem, Holland.

Important awards for exhibitions of choice hybrid amaryllis at the Decennial International Flora Show in Holland in the spring of 1935, were won by the firms of Ludwig & Company, and W. Warmenhoven & Zonen, both of Hillegom, Holland. *The Gardeners' Chronicle*, (England), published a large illustration of the Warmenhoven exhibit, in part, on page 223 of issue No. 2519, Vol. XCVII, dated April 6, 1935.

Zephyranthes robusta is the newest of these beautiful "Fairy", or "Rain Lilies" to come into real prominence for pot or garden culture. The flower is not quite as large as that of *Z. carinata*, but is more trumpet shaped, and more abundantly produced. The species sets seed easily, which *Z. carinata* does not do, and may be useful in hybridizing. The color of the bloom is a delicate orchid pink and white. A single bulb may send up five bloom spikes in a month under garden culture. The bulb is probably tender in the north. It has handsome foliage. It is the most vigorous of all *zephyranthes* yet observed and of exceptionally easy culture, taking kindly to naturalizing, in warm climates.

Zephyranthes citrina, is a handsome yellow type, with dainty grassy foliage, and a habit something like *Z. texana*. It was located some years ago in an old garden at Daytona Beach, Florida, and the bloom is golden-yellow inside and out, and sets seed readily. It is larger and more vigorous than *Z. texana*.

Crinum moorei is an absolute failure, so far as observed in outdoor culture in Florida, unless given partial shade. It also wants rich, permanently moist soil. The handsome foliage is badly burned by strong sunlight. It remains one of the most beautiful *Crinum* species. It sets seed readily, and was the stand-by of all the hybridizers for many years until the "Milk and Wine" group came in.

Mr. Cecil E. Houdyshel reports that his admirable free-blooming hybrid crinum, "Cecil Houdyshel" was produced by using pollen of *Crinum moorei* on *Crinum longifolium (capense)*. He does not recall whether the seed parent was "longifolium alba" or "rosea", but thinks it was "alba." More than 600 of such crosses were made, according to Mr. Houdyshel, and the named hybrid is the darkest and most floriferous of the lot. His latest named hybrid, "Virginia Lee" is a seedling of crinum "Cecil Houdyshel", and shows partial reversion in the bloom type to its grandparent, *C. moorei*. Crinum hybrids are usually not fertile, as Mr. Houdy-

shel points out, but "Cecil Houdyshel" bears a few seeds, especially after hand pollination. It is interesting to note that "Cecil Houdyshel" is the result of the same crinum cross as was employed to create *C. powelli*, although the latter is inferior in its ordinary varieties to Mr. Houdyshel's variety. There are improved varieties of *C. powelli* offered in Europe, called "Krelagei," and "Haarlemense."

Crinum zimmermani, according to its originator, Mr. E. P. Zimmerman, of Carlsbad, Calif., is the hybrid of *Crinum giganteum* X *Crinum powelli*. *Giganteum* was the seed-bearing parent as "Powellii" does not set seed. It bloomed for the first time in Mr. Zimmerman's nursery, "Ramona Nursery", at Alhambra, Calif., in 1914. Mr. Zimmerman describes the plant as growing 6 to 8 feet tall under best cultural conditions. The growth, he says, is inherited from the mother plant, while the color came from the male parent. The flower is a delicate light pinkish white, with long pointed petals. It is nearer "Powelli" in shape of the bloom.

June 15, 1935,
Lakemont Gardens,
Winter Park, Florida.

WYNDHAM HAYWARD,
Secretary.

Notice of 1936 Nominations

To the members of the American Amaryllis Society:

As provided by Article 5, Section 1, of the By-Laws of the American Amaryllis Society, which specifies that the secretary shall send to all voting members, not less than 90 days before the date of the annual election, a list of the offices to be filled and the names of those whose terms expire, this information is hereby incorporated in the data below, and same will take the place of a mailed notice to the members to this effect for the 1936 election:—

President	Mr. E. G. Duckworth
Vice Presidents.....	Dr. Hamilton P. Traub
	Mr. Gordon Ainsley
	Mr. James L. Gebert
Secretary.....	Mr. Wyndham Hayward
Treasurer.....	Mr. R. W. Wheeler
Director-at-large for 3 years	Mr. Walter J. Guille

Article 7, Section 1 of the Constitution, provides that any voting member may submit to the Secretary, not less than sixty days before the annual meeting, nominations for officers and directors. These shall be submitted to a nominating committee, who shall select the candidates for the final ballot.

The Annual Meeting of the Society in 1936 will be held on the second Wednesday in April, as provided by Article 10, Section 1, of the Constitution, this being April 8, 1936. Therefore the names of nominees must be submitted by the voting members to the Secretary before February 12, 1936.

June 8, 1935,
Winter Park, Florida.

WYNDHAM HAYWARD,
Secretary.

The Secretary would like to take this opportunity of calling to the attention of members again the desirability of adding new members and enlarging the field of the Society by bringing it to the attention of horticulturists and garden lovers everywhere. The 1935 Year Book, we hope, will be considered a notable example of the Society's constant efforts to bring together the latest research, the newest accurate and useful information and interesting illustrations concerning the important amaryllis family. The income of your Society is used solely for the publishing of its Year Book, the holding of Amaryllis exhibitions, and generally supporting the other worthy aims of the organization.

This useful work can only be carried out in the future and expanded by the continued support of all present active members and the steady growth of the membership. The number of pages of the Year Book, the number and size of the illustrations, and the quality of the format are strictly regulated by the funds available. Any contributions for specific or general improvements or for additional illustrations will be deeply appreciated. By giving your cooperation in this way and in the obtaining of new members you will be helping the Society to expand its many services and to bring you a Year Book of ever-increasing value and interest.

Membership in the Society is open to all persons or organizations, including libraries, interested in the advancement of amaryllis culture. Paid-up members are entitled to all the benefits offered by the Society including one copy of the current issue of the Year Book. Dues are as follows: Annual members \$2.00; Life members, \$100.00; (or as a reward for 50 new members obtained in any one year); Patrons, \$200.00 and upwards. All remittances should be made payable to the American Amaryllis Society and sent to the Secretary.

Copies of the 1934 Year Book are still available, and will be sold to new members at \$2.00 per copy. Extra copies to old members at same price.

Send in nominations for new members at an early date.

Constitution and By-Laws

of the

American Amaryllis Society

AS FINALLY ADOPTED, DECEMBER, 1934

CONSTITUTION

ARTICLE I.

NAME.

SECTION 1. This organization shall be known as the American Amaryllis Society.

ARTICLE II.

OBJECT OF THE SOCIETY.

SECTION 1. The object of the American Amaryllis Society shall be the promotion of the Hemerocallideae, the Alstroemeriales, and the Amaryllidales (J. Hutchinson, Families of Flowering Plants. II. Monocotyledons. Macmillan, London, 1934).

ARTICLE III.

HEADQUARTERS.

SECTION 1. The headquarters of the American Amaryllis Society shall be maintained in Orlando, Florida.

ARTICLE IV.

MEMBERS.

SECTION 1. This Society shall consist of the following classes of members:

Annual Members
Life Members
Patrons
Corresponding Members
Fellows

ARTICLE V.

OFFICERS AND DIRECTORS

SECTION 1. The officers of the Society shall consist of a President, three Vice Presidents, Secretary and Treasurer, who shall be elected annually. Provided, however, that one Vice-President shall be chosen from the Standard Time Zones according to the following grouping: (a) Eastern, (b) Central, and (c) Mountain and Pacific.

SECTION 2. There shall be three Directors at large, elected from the membership of the Society, to serve terms of three years, one of whom shall be elected each year.

SECTION 3. The election of one director from each branch society may be established by By-Law or action of the Board of Directors.

SECTION 4. Officers and Directors shall hold office until their successors are elected and assume their duties.

ARTICLE VI.

BOARD OF DIRECTORS

SECTION 1. The Board of Directors shall consist of the Officers and Directors of the Society, as provided in Article V, Sec. 1 and 2.

SECTION 2. The Board of Directors shall be the governing body of the Society, and shall have power to act on all matters pertaining to the Society.

SECTION 3. The Board of Directors shall meet at stated intervals and at the call of the president.

SECTION 4. One-third of the members of the Board of Directors or their proxies, shall constitute a quorum for the transaction of business.

SECTION 5. Members of the Board of Directors who are unable to be present at meetings of the Board may designate proxies; said proxies to be other than regular members of the Board. No person shall hold more than one proxy.

ARTICLE VII.

ELECTION OF OFFICERS AND DIRECTORS.

SECTION 1. Any voting member may submit to the Secretary, not less than sixty days before the annual meeting, nominations for Officers and Directors. These shall be submitted to a nominating committee, who shall select the candidates for any office.

SECTION 2. The names of the two persons receiving the highest number of nominating votes for each office shall be included in the final ballot, together with such additional names as the nominating committee shall select; provided that in case any person is nominated by the nominating ballot for more than one office, as provided above, the nominating committee shall determine the office for which the nomination shall stand.

SECTION 3. Officers and Directors shall be elected by mail ballot. The votes shall be canvassed as provided for in the By-Laws. A plurality vote shall elect.

ARTICLE VIII.

BRANCH SOCIETIES.

SECTION 1. For the purpose of developing regional interest in the objects of the Society, the Board of Directors may authorize regional, state or local branches.

SECTION 2. All members of Branch societies shall be fully paid members of the American Amaryllis Society.

SECTION 3. Branch Societies shall form and conduct their own organizations, subject to this Constitution and By-Laws.

SECTION 4. Activities of Branch Societies which might interfere with the interests and policies of other branches or of the Society at large, shall be subject to the action of the Board of Directors.

ARTICLE IX.

COMMITTEES AND SECONDARY OFFICERS.

SECTION 1. Standing committees may be established by By-Law or action of the Board of Directors.

SECTION 2. The position of editor, librarian, and other secondary officers may be established by By-Law or action of the Board of Directors.

SECTION 3. Special committees may be authorized by action of the Board of Directors or by plurality vote of the members present at any regular meeting of the Society.

ARTICLE X.

MEETINGS OF THE SOCIETY

SECTION 1. The Annual meeting of the Society shall be held on the second Wednesday in April. Other meetings shall be held at the call of the Board of Directors.

ARTICLE XI.

PUBLICATIONS

SECTION 1. The Society shall sponsor a year book and such other publications as may be authorized by the Board of Directors.

ARTICLE XII.

AMENDMENTS.

SECTION 1. This Constitution may be amended by the following procedure: The proposed change shall be submitted in writing to the Secretary, supported by the signature of not less than ten members in good standing, at least fifteen days prior to an annual meeting. A copy of the proposed amendment shall be supplied to each member with the report of the annual meeting. At the time of the next annual election a copy of the proposed amendment shall be mailed to each member with the ballots. Votes on the amendments shall be returned with the election ballots and be canvassed by the Board of Directors. Two-thirds of the ballots cast must be in the affirmative for the amendment to be adopted.

BY-LAWS

ARTICLE 1.

ORDER OF BUSINESS.

The following order of business shall be observed at all meetings unless set aside by vote:

1. Call to order.
2. Reading of minutes of previous meeting.
3. Reports of officers and committees.
4. Communications and resolutions.
5. Unfinished business.
6. New business.
7. Adjournment.

ARTICLE 2.

CLASSES OF MEMBERSHIP.

SECTION 1. Annual Members,—Persons who are interested in the purposes of the Society who shall pay annual dues of two dollars.

SECTION 2. Life Members,—Persons interested in the purposes of the Society who shall pay one hundred dollars, or who secure fifty or more new members in any 12 months period.

SECTION 3. Patrons,—Persons interested in the objects and aims of the Society who contribute two hundred dollars or more to its support, and who shall pay no dues.

SECTION 4. Corresponding Members,—Those whom the Society has elected in foreign countries to report on subjects of interest to the membership and who shall pay no dues.

SECTION 5. Fellows,—Those whom the Society has elected as Fellows in recognition of their achievements in the special field of the Society and who shall pay no dues.

ARTICLE 3.

VOTING PRIVILEGES, ETC.

SECTION 1. All classes of members shall be entitled to vote, and shall be eligible to hold office.

ARTICLE 4.

ELECTION OF MEMBERS.

SECTION 1. Nominations for membership in the Society shall be presented to the Secretary in writing, accompanied by the required dues. All applicants for membership shall be approved by the membership committee, subject to review and action by the Board of Directors.

ARTICLE 5.

ELECTION OF OFFICERS AND DIRECTORS.

SECTION 1. The Secretary shall send to all voting members, not less than 90 days before the date of the election, a list of the offices to be filled, together with the names of those whose terms expire.

SECTION 2. The Board of Directors shall select a nominating committee of three members at least two months before the annual meeting.

SECTION 3. The nominating committee shall obtain the written consent to serve from all nominees before the names are placed on the final ballot.

SECTION 4. Ballots shall be sent to each member one month before the annual meeting. Ballots shall be returned to the Secretary and must reach him not less than five days before the annual meeting.

SECTION 5. The President shall appoint at least three tellers to canvass the final vote for each office.

ARTICLE 6.

DUTIES OF OFFICERS.

SECTION 1. The President shall perform the usual duties of such office, be the directing head of the Society, and chairman of the Board of Directors.

SECTION 2. The Vice-Presidents in order of seniority in years shall act in the absence or incapacitation of the President.

SECTION 3. The Secretary shall keep a record of the proceedings of the Society and of the Board of Directors, and conduct their correspondence. He shall collect and pay to the Treasurer all moneys due the Society, getting his receipt therefor. He shall also keep a record of all receipts and expenditures of the Society as authorized by the Board of Directors.

SECTION 4. The Treasurer shall receive from the Secretary all moneys belonging to the Society and shall deposit the same, as directed by the Board of Directors. He shall pay out all moneys only on written notice from the Board of Directors. All payments shall be made by check, signed by the Treasurer, on accounts approved by the Board of Directors.

SECTION 5. The Board of Directors shall arrange for meetings of the Society and for exhibitions and tours. It may appoint sub-committees from its members or committees from the Society at large for specific purposes. It shall consider the formation of branch societies. If a vacancy occurs in any office of the Society, the Board of Directors shall fill the vacancy by appointment for the unexpired term.

ARTICLE 7.

PAYMENT OF DUES.

SECTION 1. The fiscal year of the Society shall begin on the first day of January.

SECTION 2. The year book shall be sent only to those members who have paid their dues for the current year. Members whose dues have not been paid by March 1st shall be considered delinquent. They will not be entitled to receive the publications or other benefits of the Society until arrears are paid.

SECTION 3. The names of all members whose dues have not been paid by July 1st shall be dropped from the rolls of the Society. Due notice of non-payment of dues will be mailed to delinquent members on or after March 1st, but nothing in this Article shall be construed as making such notice obligatory on the part of the officers of the Society, or the non-receipt of such notice the cause for any action against the Society, or its officers on account of removal from membership, or non-receipt of any of the Society's publications or other benefits.

ARTICLE 8.

MEETINGS OF THE BOARD OF DIRECTORS.

SECTION 1. A meeting of the Board of Directors shall be held on or before the first Wednesday in April of each year, for outlining the work and activities of the year.

SECTION 2. Other meetings will be held by direction of the Board.

SECTION 3. Special meetings may be held on two weeks' notice at the call of the President, or on request of three members of the Board.

ARTICLE 9.

BRANCHES.

SECTION 1. Each state and regional branch society shall elect a member to represent it on the Board of Directors.

SECTION 2. Regional or state branch societies having representation on the Board of Directors shall consist of not less than fifty members residing in such region or state.

SECTION 3. Fifty cents of the membership dues of each branch member shall be made available for the use of the regional, state, or local branch to which the member belongs.

ARTICLE 10.

STANDING COMMITTEES

SECTION 1. As soon as practicable after the annual meeting, the President shall appoint the following standing committees:

- | | |
|-----------------|---------------------------|
| 1. Membership | 5. Exhibitions and Awards |
| 2. Finance | 6. Trial Collections |
| 3. Auditing | 7. Research |
| 4. Publications | |

ARTICLE 11.

SECONDARY OFFICERS.

SECTION 1. As the need shall arise the Board of Directors shall appoint an editor, a librarian, or such other secondary officers as may be needed.

ARTICLE 12.

AWARDS.

SECTION 1. The Society may award, in accordance with the importance and value of the exhibit or contribution to the culture of the Hemerocallideae, the Alstroemeriales and the Amaryllidales, Gold medals, Silver medals, Bronze medals, First Class Certificates, Awards of Merit, Cultural Certificates and other awards.

SECTION 2. The Society may recognize by suitable award persons, corporations, or other institutions who or which have made great contributions to the culture of the Hemerocallideae, the Alstroemeriales, and the Amaryllidales.

ARTICLE 13.

PUBLICATIONS

SECTION 1. The Board of Directors shall supervise the issuing of the publications of the Society.

SECTION 2. The publications of the American Amaryllis Society shall not be sold or otherwise furnished to other than members of the Society except as approved by the Board of Directors.

SECTION 3. Back numbers of publications may be sold to new members desiring copies of the same at prices as determined by the Board of Directors.

ARTICLE 14.

AMENDMENTS.

SECTION 1. An amendment to the By-Laws may be adopted by a majority vote at any meeting of the Board of Directors, providing a notice in writing has been mailed to all members of the Board one month in advance of the meeting.

SECTION 2. A proposal to amend the By-Laws may be submitted in writing to the Board of Directors by any branch society or by any five members.

1. Regional Activities and Exhibitions

Notes on Amaryllid Activities in Australia

G. K. COWLISHAW, *F. R. H. S.*
New South Wales, Australia

1. The Cultivation of Amaryllids in Australia.

Australian climatic conditions favour the culture of most of the temperate and sub-tropical amaryllids in the open garden. In the Northern part of the Continent, tropical species, such as *Eucharis* flourish in the open garden, though in the South, they need, at least, the protection of a greenhouse.

Outstanding among the various genera of amaryllids that are cultivated here, are the *Hippeastrums*. These take kindly to our climatic conditions, and it is the general opinion of the enthusiasts in this class of amaryllids, who have seen the best of the oversea collections, that those strains, raised by Messrs. P. V. McCulloch of Warrawee and E. McCulloch of Mosman, in this State, are the best in the world.

These strains are more or less intermingled, though the latter possesses the greater range of colour, and are the result of many years of careful cross breeding and selection. The commencement of the strain was from plants of the once famous Bradley collection, in its day as outstanding as are those of the McCullochs today. Bradley was a very keen hybridist specialising in *Amaryllidaceae*, and he raised some very beautiful flowers. In the *Hippeastrum* he aimed at large regular flowers, with equal perianth segments, clear colours and well reflexed petals.

On Bradley's death Mr. P. V. McCulloch took up the work from where he left off, and gradually by patient work and always following the ideals laid down by Mr. Bradley, achieved the wonderful strain he possesses today. His nephew, Mr. E. McCulloch, who always took a keen interest in these plants, and the work of his uncle, during the past ten years or so, has made a good collection of plants, all seedlings of either P. V. McCulloch's raising or his own.

The method adopted in their culture, is to set out the bulbs in a fairly light soil, deeply worked and well enriched with manure. The bulbs are set out in rows about 2 feet apart and about 18 inches between the bulbs in the rows. Planting is done in February, the 1st month of Autumn, when the roots are making the Autumn growth. This means that the plants, already fully leaved move off as if nothing had happened. We find that if the bulbs are lifted in the winter as is the practice with most commercial houses, that they are very slow in starting and in many cases will rot with the spring rains.

Most *Hippeastrum* bulbs in the Sydney districts go to rest about May, and the new leaves appear just before the flowers in the spring. As many as 5 flower scapes are produced on large bulbs. Just before the flowers and leaves appear, the beds are given a dressing of fresh manure, horse manure for preference, and even if hot it goes on to the beds. The manure is applied as a mulch 2 to 3 inches thick. About this time too, a screen of scrim is thrown over the beds, so that the garden appears as being set with large tents. This has the effect of protecting the giant flowers against the winds and the scorching mid-day sun. It permits of them retaining their colours longer, and keeps the flowers in the pink of condition for a long period.

The flowers of these strains are in the main of a deep self crimson for it was this colour for which both Bradley and McCulloch bred, most of these possess a black eye and do not show one particle of green. Others have white grounds marked with red, brick red, and reds in many shades, selfs and mottled or striped, and of recent years some particularly good salmon shades, and deep pinks. It is only during the last four or five years that any foreign strains have been introduced.

The flowers themselves are perfect. Large ones up to 14 inches across each individual flower being common, and very few are less than 10 inches across. The plants are very rigorously culled at flowering time, and many a plant is consigned to the dust bin, which, if it occurred in another raisers seed bed, would call forth exclamations of delight.

There are many other breeders of these flowers, the best of whom is Mr. W. Hawes of Gladesville. Mr. Hawes has been breeding *Hippeastrums* for the past 25 years, and has created a very worthy strain. During the past few years marked strides have been made in their form and shape. There is possibly a larger range of colour in these than in the McCulloch's strain.

I have raised a number of good seedlings myself, working pollen from the McCulloch's flowers upon bulbs imported from England. The latter though on the small size, the largest never attaining to a diameter of more than 9 inches, are very symmetrical and possess good colour. The crosses have given some very good things. I imported some bulbs from the U. S. A. from time to time about 6 or 7 years ago, but have discarded them all, as they are far too rough and ragged, and have a very narrow lip petal, and in addition the flowers were decidedly pointed. I should say that the illustration on p. 99 of the 1934 Year Book was quite typical of those imported by me. Owing to lack of space I have not raised any seed during the past three years.

There are a number of growers both in this State and in the other States who raise a number of seedlings, most of them commercially, but seem to work in a happy-go-lucky manner, making crosses without any consideration of what the result may be. Needless to say, they are creating nothing worth while, and making no progress towards the ideal flower.

The rate of increase is somewhat slow, and candidly is not much worried about. As the Amateur growers who possess the best collections do not worry so long as they possess the stock and a few bulbs every year or so to breed from, and the commercial growers have found it cheaper to grow the plants from seed. Seedlings take 30 months to flower with us, and give their best flowers in their 4th or 5th year. Plants are lifted every four or five years. The soil is thoroughly manured, and dug, and the bulbs are replanted. So far as I know they are subject to the attacks of no pests or diseases.

We find that the pollen parent gives colour and the seed parent shape and size.

Narcissi in their various forms are very popular, particularly in the Southern States, where there are many wonderful varieties raised each year. Messrs. West & Fell of Casterton, Victoria, Mr. H. A. Brown of Camberwell, Victoria, and Mr. Alister Clerk are all noted raisers of these wonderful flowers in their State, and one can confidently say that their new creations will hold their own with the best produced anywhere in the world. Mr. H. A. Brown is the most recent recruit of the three, but without doubt his productions are the most outstanding, particularly in the red cupped *Incomparabilis* varieties. Mr. Alister Clerk's varieties include some very wonderful *Leedsii* types, and Messrs. West & Fell have given us some of the best Trumpet sorts we possess.

In Tasmania there are a number of growers who have raised many beautiful sorts. As these growers are all amateurs none of their creations have as yet found their way into commerce, and we have seen none of them on the mainland.

In this State, Messrs. Holloway Bros. of Brookvale have about the largest commercial collection. They raised, in the past, some very wonderful flowers, but during the past 10 years practically none. Their giant Trumpets are particularly outstanding, but are now being superceded by still better varieties. One C. W. Holloway won the champion prize at the Royal Horticultural Societies show here in Sydney 7 times in the years 1922-1932.

Dr. H. R. G. Poate, who grows his bulbs in the congenial climate of Bowral, has a wonderful collection of imported varieties, and is raising seedlings on a large scale. Already, those which have flowered show great promise. As he is using the best of the new varieties imported from the United Kingdom, as well as those of local production, some great things should come from his garden in the next few years. Mr. Hawes of Gladesville has been raising seedlings for very many years and in the past has introduced many very beautiful varieties.

The writer has been raising seedlings for the past twelve years and has had some very good results. One seedling Trumpet received Champion honours at R. H. S. Show in 1926, and another in 1927. As I was carrying on a series of experi-



G. K. Cowlshaw

Hybrid Belladonna Lily: Alabaster

Colour: pure white with yellow eye; height, 27 in.; 23 flowers on scape; individual flowers, 7½ in. (Maximum). Breeding history:—

f-1 B. multiflora rosea (Bidwell) x A. belladonna

f-2 B. Haythor (Bradley)

f-3 Self

ments in line- and in-breeding I did not expect wonderful results in the first generation or so, but am now concentrating on the production of high class show flowers. Next year I should flower some 2,500 seedlings of first class percentage, and the year following twice as many. This year I produced more seed than I knew what to do with.

While the climatic conditions of Victoria and Tasmania, and the highlands of this State, are ideal for Narcissi culture, we in the Sydney districts, and along the coastal belt, have a climate just too warm for them. We are quite 3 to 4 weeks earlier than Dr. Poate on the highlands at Bowral, where he possesses the ideal Daffodil climate.

The early workers here in New South Wales in the Daffodil field aimed at the production of early flowers and the late Mr. H. Selkirk one of the earliest workers had Trumpets opening in May (the first month of winter) and the late Mr. H. B. Bradley had Trumpets opening in the last week in April.

They fixed their Show for the second week in August and set out to breed flowers to show at it. Flowers which appear in the second week of September onwards are too late with us and only last a few days as they are soon scorched by hot westerly winds.

When I first commenced hybridizing, I too, adopted this ideal of the early flower, but soon becoming interested in the showing of blooms concentrated on the production of mid-season flowers. During the past 5 years however, I have again returned to the old ideal and am endeavouring to produce a series of first class flowers in June and July, at which time of the year, they will last about 3 to 4 weeks on the plant. Using "Fortune" as a parent and the other good things of July and August flowering, one should gain this objective in a generation or two.

There are a number of other growers who raise a few seedlings each season, but they are not working along any set lines.

The scope of this paper is too wide for me to go into detail of the culture of Narcissi here in Australia, but I must mention that only one real pest worries the Narcissi grower and that is the eel worm, which plays havoc with all collections not regularly sterilised.

Next in importance are the true *Amaryllis*, or as some few call them "Belladonna Lilies", and their close relations, the *Brunsvigias*. About 1870 one Bidwell, a noted horticulturalist of his day in this country, raised a series of hybrids between the *A. belladonna* and *Brunsvigia grandiflora*, and these are the most widely grown of all Amaryllids today, under the name of "*Brunsvigia multiflora*", "*B. multiflora alba*" and "*B. multiflora rosea*". They are all good seeders and as one can quite well imagine, their offspring does not come true.

A well grown specimen will carry a head of thirty to forty flowers, *B. rosea* giving the largest heads, and *B. alba* the smallest. These have become widely dispersed throughout New South Wales gardens, and on account of the rapidity of their increase, and their taller stems and larger flower heads, are much more widely grown than *A. belladonna*. Of the "Belladonna Lily" proper we possess many forms of which "Rubra" is the brightest. The late Mr. H. B. Bradley raised a very fine seedling of the "Multiflora" type viz., "Haythor", pure white with an orange yellow eye. This is very quick in increase and is becoming widely spread throughout Sydney gardens.

Of recent years many seedlings have been raised by the trade from self set seeds of the "Multifloras", and presumably a number of crosses between the various varieties have taken place. Messrs. Holloway Bros. have given us "Harboard", a good white, and "Oviato", a deep pink.

I myself have raised many thousands of seedlings of these beautiful plants and will deal with them in a later part of this paper. These plants make very good growth with us, making most of their foliage in the Autumn and winter, and early spring, the wettest period of the year. In Sydney the bulk of our 46 inch rainfall occurs in that period. They flourish in any sort of soil, and I find that full sunshine or partial shade suits them very well indeed.

In planting we set the bulbs about 2 feet apart each way and with their neck and shoulder projecting above the soil. As a group, they resent interference in a very marked degree and seem to flower best when crowded. I am quite positive that with these plants the same bulb does not flower year after year, but say once in every two or three years. Deep digging of the soil before planting, and a dress-

ing of manure just as the bulbs push through the ground helps materially in building up large bulbs and consequently in flower production.

Where they have been left alone in old gardens they quickly spread on account of the production of seed. Cross fertilization produces far more seed than self fertilized flowers. This I have carefully noted over a number of years. A cross fertilized seed pod will average 40 to 50 seeds and I have seen as high as 70, while a self fertilized seed pod will average not more than 20. The white varieties are the shyest seeders and the seedlings are the poorest growers of all, though, after their first three years they settle down and there is not much difference between the white and coloured forms. Colour is the dominant characteristic of the pollen parent. "Haythor" particularly transmits it in a marked degree.

Clivias are popular as pot plants, and are always at their best as such on account of their flowering best when pot-bound. Quite a number of good hybrids were raised 20 to 25 years ago by Messrs. Selkirk and Arthur Yates, but never in any great quantity. The late Mr. Selkirk thought it wonderful if he got from his plant half a dozen seeds. I get from some of mine 300 seeds per head.

A number of hybrid forms were imported from England, and from them the Clivias sold today were derived. There are practically no pure *C. nobilis* or *C. miniata* to be had in the trade today. The few which exist are to be found in old gardens.

C. cyrthanthiflorum is also scarce. This is a so called hybrid of a reputed parentage, *C. nobilis* x *C. miniata*. I have raised hundreds of this cross and have never had a seedling yet with flowers in narrow drooping umbels as in *C. cyrthanthiflorum*. It only survives in old gardens today.

Mr. R. M. Finch has raised some very fair varieties, and had some very good pale ones. One in particular was almost a white. Holloway Bros. of Brookvale purchased a lot of Mr. R. M. Finch's stock and have raised a number of seedlings of merit. In the Sydney Botanical Gardens there are a number of seedlings of rather dubious merit. Of my own experiments and their results you will read later in this paper.

*Crinum*s are not widely grown, except in a few species. Our native *C. pedunculatum* is found in many gardens, as are also *C. powellii*, *C. moorei*, *C. latifolium* and *C. capense*. In the past a number of hybrids of the *C. moorei* type were raised by the late Mr. H. B. Bradley; some of which are very vivid pink, but all totally infertile. Messrs. Holloway Bros. had a very beautiful hybrid *C. pedunculatum* x *C. moorei* of a brilliant pink. I know of another seedling of this cross in an old garden which is a delightful pale pink. In a period of 15 years this plant has only made two bulbs. It is quite infertile. Other than these I know of no hybrid *Crinum*s raised in Australia except the few raised by myself and of which more later. There are of course a number of named forms of *C. moorei*.

All the above do well in good garden soil. They seem to prefer full sunlight, though many are grown in shade and semi-shade but these do not flower as well as they might if set in the open. Plenty of water while growing is a necessity.

Nerines are good plants for our conditions, though I find that they do very much better in Tasmania and Victoria. A number of hybrids have been raised here in Australia, but not one grower seems to have raised any number or to have recorded their parentage. I have raised a few, some of which are quite interesting as hybrids. They like to become crowded before flowering freely.

Zephyranthes do very well though not grown to any extent. *Z. candida* used to be commonly used as a border for many gardens, but recently it has almost disappeared. *Z. ajax* is a variety which does well with me, also *Z. texana*, *Z. rosea* and another pink variety, and the *Cooperias*. I have raised many seedlings, *Z. candida* x *Z. ajax*; *Z. candida* x *Z. texana* (known here as *Z. sulphurea*) and *Z. rosea* x *C. drummondii*. I find that *Z. candida* is the dominant parent in the two former crosses. In the second generation some good cream coloured flowers appeared, and also some good pale yellow ones. By inbreeding the second generation I procured a good number of deep yellows, and one or two with bronze outside and a deep buff inside. Seedlings flower in about the second year. In the cross *Z. rosea* x *C. drummondii* some very fine flowers were produced, mostly of a very large size and of a pink or salmon pink shade, though one or two almost pure white ones appeared. They multiply fairly rapidly, and seedlings flower about the second year. The cross is quite fertile and seeds freely. The seedlings themselves of the

second generation give no marked improvement. A number of interesting forms have been isolated and are being grown on.

In addition to the above we have a great number of amaryllids of all sorts growing in our gardens, and all doing well.

2. Raising Seedling Clivias, Amaryllis, and Crinums.

Some fourteen years ago, I possessed several plants of *Clivia nobilis* and a plant or two of *C. miniata*. The former were orange red, and the latter were orange. In September of 1920 I crossed the flowers of these plants both ways. The resulting seedlings, to the number of 73, grew steadily but slowly. The first flowered in August 1925. All were vigorous, and on the whole, far more robust than their parents. The flowers produced in quite 90 per cent. of the plants were decidedly larger than those borne by either of their parents. The colours varied very little being mostly orange red.

One might suppose that from this generation would have come some little colour variation, as quite a range of colour is found in these plants in their native habitat. But both parents being of the same shade almost, no colour break occurred.

The flowers that appeared, as compared with those I now possess were decidedly ugly, and with very narrow perianth segments with pointed tips as in their parents. From these were selected those with the widest segments, the roundest tips, the largest flowers, and most robust in growth. These were intercrossed.

The seedlings resulting from these secondary crosses were decidedly an improvement on their parents. Not only was there a marked increase in their vigor, but they attained to a flowering state in four years, from the sowing of the seed.

Some of the flowers in this batch, compared with those of their grandparents, were truly remarkable. From some three hundred seedling plants 25 were selected of exceptional horticultural merit. Among them were to be found the perfectly symmetrical flower, with large broad overlapping perianth segments, all of the same size, and with nicely rounded and reflexed tips. The range of colour or rather shade has increased, but not to the extent I had anticipated. No pale flowers had appeared as was confidently expected, though one of a deep brick red colour of somewhat poor shape stood out as a decided acquisition. For the most part they were all deep orange red with deep yellow eyes, though in some few the yellow was more or less replaced by white and in others had advanced up the perianth segments at the expense of the orange colour.

The best of this batch had a head of flower standing last season 32 inches high, and was composed of 23 perfect flowers in a globular head. The individual flowers were 5 inches across, perfectly round and reflexed. It has caused no little comment when exhibited at the R. H. S. Show in August during the past three years.

From the second generation, I raised a third batch all of which were "selfed". Whereas I had no difficulty at all in obtaining seed berries containing as many as 10 seeds from flowers fertilized with the pollen from another plant, I discovered that the "selfed" flowers set seed badly, and where they did set it, I did not obtain more than 2 seeds from any one berry. Some of the seedlings flowered in the third year from sowing. And last season, the 4th from the sowing, some 125 flowered leaving but few still to flower. Those which flowered early were dwarf plants with a slender flower stem, and pendulous starry flowers all much alike.

They attain a height of 15 inches and make excellent pot plants. They increased little in size for the second season's flowering. So the new type appears fixed. Is it possible that the *Clivia* species as we now know them are of hybrid origin, and that these are throwbacks to an older and now lost species?

Many of the others of this batch reverted to the starry form of *C. nobilis*, and one can hardly tell them from the original plant from which they sprung. Variation in foliage is very marked, and it is particularly noticeable that whereas the original species possessed foliage 1½ inches wide some of the seedlings of this batch which are some 4 feet high, possess foliage quite 4 inches across. The flowers of these broad leafed sorts are invariably large, round and reflexed.

Another feature is that many are rapid in increase. All the former were slow, no plant after seven years flowering had more than 4 new growths, but some of

the new seedlings even before they flowered had three or four growths breaking away, and one in particular (a poor flower type it is true) has in its third year of flowering, made upwards of 15 new growths.

Seedlings have already been raised from these. Selected seedlings were again intercrossed with the idea of securing colour variation for in the colour range no pale variety was found, though the number of deep brick red ones had increased in a marked degree. It should also be noted that greater areas of white appeared in those varieties where the white was apparently displacing the yellow; and in cases where the yellow was displacing the orange, this colour had crept up the perianth segment nearer the top. Perhaps the next generation will give (a) a red flower, (b) an orange and/or a white one, and (c) a yellow one. These are my present objectives.

I find *Clivias* the easiest of plants to grow, and one can justly say that the seemingly the worse they are treated, the better they respond. Mine are all growing in bush houses in pots, for I have found that when their roots are pot bound they flower the best. One is astonished at the small quantity of soil necessary to support them, and the amount of dry conditions they will stand. They thrive equally well out in the garden, though the plants will not push their flower spokes well above the foliage.

Seed takes a year to ripen, and when ripened will stay quite twelve months on the plant if not harvested. When ripened, the berry, as large as a walnut, contains upwards of 10 seeds. The bright scarlet berries, are, to many, equally attractive as the flowers. By the way, I find a variation in the colours of the berries in the newer hybrids, for whereas in the old species they were scarlet, those of some of the new seedlings are a deep cerise pink.

Germination after sowing is slow but sure. Once sown the plant will eventually appear and make rapid growth. Any soil seems to suit them well though one on the light side possibly is best. If grown in a pot perfect drainage is essential. Potting on from size to size should be done as soon as the plants have become too large for their pots. A final potting is recommended the year after flowering into 10 inch pots in which they can remain until they need dividing.

About the same time that I became interested in *Clivias*, I commenced raising seedling *Amaryllis*, *Brunsvigias*, and *Crinums*. As a start I possessed an *A. belladonna*, a good pink variety; *Brunsvigia multiflora*, *B. multiflora alba*, and *B. multiflora rosea*. Later on *B. josephinae* and another of the "Multiflora" type viz., "Haythor", raised by the late Mr. H. B. Bradley, and reputed to be a seedling between *A. belladonna* and *Brunsvigia multiflora alba*. This I doubt for the reason that will later appear.

Of *Crinums* I possessed *C. capense* and *C. moorei* and *C. latifolium*, all African species, and *C. pedunculatum*, our native *Crinum*, a number of hybrid forms of *C. powellii*, and some seedlings of the late H. B. Bradley. The so called *Brunsvigia multiflora* and its varieties are in fact bigeneric hybrids between *A. belladonna*, and in all probability *Brunsvigia grandiflora*. These were raised by Mr. Bidwell, a well known florist in this city, about 1870, and owing to the vigor of their growth their large heads of flowers, and the rapidity of their increase, they are as widely grown about Sydney as the "Belladonna Lily" itself.

Seedlings from any of the "Multiflora" types do not come true if the flower is selfed, some diverging to *A. belladonna* and some reverting to the lowly stature of *B. grandiflora*. This also occurs in breeding. I found that these and *A. belladonna* would intercross in any way and would all produce fertile seed. But the variety "Haythor", a beautiful pure white with a small yellow eye, raised by Mr. Bradley, would not give me any seed at all, though its pollen is extremely potent. Thus we have a plant of a reputed parentage similar to some five hundred seedlings I have raised, not one of which has refused to set seeds, which over a period of some 12 years with me has not given the slightest indication of even a swollen ovary. Unlike the seedlings of *A. belladonna* x *B. multiflora* which I have raised, "Haythor" has ruffled petals, with crimped edges.

All the seedlings from its pollen are somewhat weak in growth, mostly white with an eye of yellow, and will not set seed though in almost every case their pollen is extremely potent. I am rather inclined to think that Mr. Bradley was mistaken in its parentage, and that it is a particularly good form of *B. josephinae* x *B. multiflora alba*.

The first crossings were *A. belladonna* with each of the three varieties of *B. multiflora* which I possessed. The quantity of seed obtained was very great in the case where the "Multiflora" varieties were the seed parents, and not so great in the case where "Belladonna" was the seed parent. In the former case, I have had as many as 105 fertile seeds from one pod, and over a season have averaged 70.

The resulting seedlings flowering some four years later were more or less disappointing, mostly taking after *B. multiflora* (which at that time I considered to be a true species of *Brunsvigia*), and a very few after "Belladonna." The colour variation was not great, and one would have had great difficulty in finding more variation in these than in any batch of "Multiflora" or "Belladonna" seedlings. But I found that all the seedlings on flowering were fertile and set seed with the utmost freedom, and were particularly rapid in their increase.

Accordingly I selfed those which possessed good form, and other promising characteristics, as I could see no advantage to intercross them. The results were extremely interesting. Some have attained to great size of flower stalk, size of flower and number of flowers in a head. The colour variation is considerable. Some are of the deepest carmine pink, others of a pure glistening white with a yellow eye, like "Haythor", but without the wavy petals of that variety. Amongst these I selected many as being worthy of propagation. The segments of the perianth in those selected are equal in size, round and slightly reflexed.

Some of these are of a delightful blend of pink and orange. The latter colour which is present in all the seedlings in the form of an eye, has in these examples, run almost to the tip of the segments. Others are of shades of pink inside, but with the exterior of the segments picked out and stained bronze. Still others are of a small stature attaining to a height of not more than 15 inches with small flowers of a soft self pink shade. This latter type, while strong growing and vigorous, is easily smothered in a seed bed and needs isolating as soon as discovered.

Another interesting type has appeared in these seedlings perhaps forming 5 per cent. of the whole. These possess no flower stalks at all, but have large pink flowers of excellent form carried on long peduncles and as the leaves appear with the flowers give the plants the appearance of a giant pink crocus. So far I have been unable to secure any seed from these plants as the ovaries are situated down among the base of the leaves, and so apparently cannot swell. Their pollen, is, however, fertile, and seedlings from it are now being grown on.

At present all breeding being done is aimed at (a) larger flowers, (b) perfection of two types, large and small, (c) larger colour range by endeavouring to (1) exclude the yellow eye, (2) increase the yellow eye so that the whole flower becomes yellow, (3) produce a bronze flower, (4) produce a red flower; (d) produce large symmetrical flowers on large globular heads; and (e) rapidity of increase.

Some surprising results have been had in intercrossing *Crinum*s. As mentioned in the former part I have been somewhat restricted in cross breeding in this genus on account of the few species I have been able to procure.

I find that *C. moorei* seeds well, with the exception of one group of plants which were produced from an old garden. These are not entirely infertile but from over 300 flowers pollinated, either with their own pollen or from other species, only three seeds were obtained. There is little difference between this and the usual type, with which we are so familiar, except that perhaps, the perianth segments are just a little wider.

From *C. moorei* I have raised many seedlings, for every flower which is not cut, in some seasons, sets seed. And in spite of claims to the contrary, I have found no more variation in its offspring than one would expect in a species. I am quite at a loss to understand how some claim that *C. moorei* is not a true species.

On the other hand, the seedlings I have obtained from the *C. moorei* which does not set seed freely, and which for purposes of identification I will designate as *C. moorei* II, have shown considerable variation in the few raised even where self fertilized. Is it not possible that hybrid forms such as this undoubtedly is, going under the name of *C. moorei* have given rise to the belief that *C. moorei* varies from seed?

I find variation in *C. capense*. From the same seed pod I have had flowers ranging from white to deep pink. Some forms are at first glance difficult to separate from *C. latifolium*.

Even in our native species *C. pedunculatum*, I find variation, though it is here regional. Some have long segments, others short, some long peduncles, and others

short, and still others have purple filaments and anthers. As already mentioned I have seen hybrids between *C. pedunculatum* x *C. moorei* in deep and pale pink. In 1924 I raised a seed from this cross, the only one in the pod. This grew rapidly, and increased by offsets in an amazing manner in the style of *C. moorei*. In 1929 at Christmas time it flowered for the first time. I then possessed some 9 bulbs. The growth of the plant was intermediate between the two parents, more massive than *C. moorei*, and not so tall as *C. pedunculatum*, with its foliage appearing much like the latter. It is deciduous like *C. moorei*. The flowers, which are highly perfumed, are of perfect *C. moorei* shape, and of a pure glistening white like *C. pedunculatum*. One might say that here we have the pure white *Crinum* inheriting all the good qualities of both parents and none of their faults. It is intermediate between the two and, in spite of numerous attempts to obtain seed or use its pollen, completely infertile.

The two other hybrids of this same cross referred to, while possessing the pink coloured flowers, had much the growth habit of "Pedunculatum", and were ever-green like that species. The flowers however were ugly. In one case they were intermediate between the two parents, and the other had starry flowers after the style of "Pedunculatum", but with broader perianth segments. I have quite a number of this cross growing on.

C. capense x *C. latifolium* offspring give flowers much like their parents, for there is very little dissimilarity between these two species. They, however, take after the yellowish green foliage of the latter and not after the blue green foliage of the former. "Capense" is a good seeder with me to either its own pollen, or that of "latifolium", but to any of the "Moorei" group or to "Pedunculatum" a peculiar thing takes place. The seed pod swells to an immense size, and in due course like all other seed pods it bursts and reveals a mass of seeds within and to all appearance perfect. On examination, however, we find that they are all so grown one into the other that they cannot be separated without injury and even when separated would not grow, rotting in a few days. This has occurred on every occasion, and there have been some hundreds, upon which I have attempted to raise seed upon "Capense" by either "Moorei" or "Pedunculatum."

Two years ago I determined to germinate some of these seeds, and separated them as carefully as possible with a sharp knife, sealing the wound where it occurred with paraffin. Some 800 seeds were separated in this manner and of these some 50 germinated, and though very weakly in their young period, some 20 still remain alive and are making sure but slow progress. I trust that they will flower in due course, and not be like a series of seedlings raised by me in 1923 from 'Moorei' x "Magnifica", a variety raised by Mr. H. B. Bradley of the "Moorei" type, and from which although they increase in a most wonderful manner I have only had one flower in 8 years.

By crossing "Moorei" and "Capense" I have raised "Powellii" on many occasions. However, the pollen of this variety on either of the parents has never led to seed production. "Pedunculatum" x "Capense" has given me a few seedlings which have not yet flowered.

In *Nerines* I have raised a few seedlings. One of these is outstanding from a horticultural and scientific point of view,—*N. bowdeni* x *N. ficifolia*. This was the only one of this cross which attained to flowering size, although some forty were raised. It is extremely interesting, having the foliage of *N. bowdeni* and the late flowering properties of that variety, but the shape of the flower is like *N. ficifolia*, though much larger and of much the same shade. The flowers are carried on three foot stems, in large numbers in May of each year, some bulbs having three or four flower scapes. Although raised in 1925 I already possess not less than 300 bulbs, so one can realize the rapidity of its increase. In 1929 I succeeded in seeding to its pollen *N. sarniensis* and this year one of the progeny produced flowers of a beautiful salmon pink shade, three scapes to the bulb!

I have raised a number of *Nerine* seedlings from hybrid varieties imported from time to time, but I am concentrating now upon the "Bowdenii" x "Ficifolia" crosses as they are the ideal florist flower.

These few notes summarize my hybridizing experiments among the *Amaryllidaceae*.

3. Australian Amaryllidaceae.

The following is a list of the *Amaryllidaceae* native to Eastern Australia arranged according to Dr. Hutchinson's system. It is not a complete list, though representing most of the recorded species. There is some slight confusion in the identity of a few species, especially those recorded from the West. I will endeavour to have a complete list with descriptions for the 1936 Year Book.

TRIBE 6. CRINEAE

Crinum pedunculatum
C. douglasii
C. venosum
C. brachyandrum
C. brevestylus
C. uniflorum
C. angustifolium
C. pestalantis
C. brishanicum
C. flaccidum

TRIBE 10. EUCHARIDEAE

Calostemma luteum
C. album
Eurycles amboenensis
E. cunninghami

Indigenous and Cultivated Amaryllidaceae in Kenya Colony

THE LADY MURIEL JEX-BLAKE
Kenya Colony, British East Africa

Kenya Colony, for the information of those whose geography is vague, lies across the Equator in Africa, from the Indian Ocean on the east to Lake Victoria Nyanza on the west; with a climate which varies from a tropic heat at the Coast, to temperate coolness in the Highlands, where the majority of White settlers have made their homes and gardens, at an altitude of from 5,000 ft. to 8,000 or even 10,000 ft. above the sea.

At these altitudes the climate is as nearly ideal as is possible in this world, and, far from being tropical, is cool and pleasant, while frosts occur only at the higher altitudes.

The Colony possesses an interesting indigenous flora, which includes a fair number of Amaryllidaceae, headed by a good selection of *Crinums*. *C. kirkii* is the most common, occurring all over the Colony, and is a handsome species, large and vigorous with striking flowers that are white, striped down each petal with varying shades of purplish pink or red. *C. giganteum*, from the western side of the Colony, is even more beautiful, larger, taller and pure white, but less easy to grow, and not very free flowering. It is sweetly scented, whereas *C. kirkii* has a heavy and almost unpleasant scent. *C. amموcharoides* is less widely distributed than *C. kirkii* and is a very different plant; the leaves lie on the ground almost flat, alternate leaves turning alternate ways, giving an appearance of plaiting which is most attractive; while the far smaller long-tubed flowers vary from pink to white and are very sweet. An even smaller species is *C. parvum*, with the same habits

of growth as the last, and most charming delicate white flowers turning to pink as they grow older. Both these smaller species are easy in cultivation, and bulbs of *C. parvum* sent to Kew, flowered the year after.

One beautiful species of *Cyrtanthus*, *C. sanguineus*, grows fitfully through the Colony, on dry plains, bearing one to two large flowers of a beautiful blood red. But it does not flower every year, and only for very short periods when it does, and is not fond of being tamed.

Haemanthus multiflorus is a charmingly common plant all over the country, and seems specially brilliant as it chooses to flower annually at the end of the dry season and just before the long rains, and the gay scarlet puffs of flowers are almost startling when the grass and bush are dry and brown. The large leaves do not show till the flower is over. *H. filiformis* is another species, less common than *H. multiflorus*.

An even larger red ball of flowers is produced by *Buphane* sp. nr. *disticha*, which grows on rocky dry hills in various part of the Colony, and again produces its flowers before the leaves. It is less brilliant than the *Haemanthus*, being a pinky red, but the flowers are so large that they look quite impossible coming out of the dry neck of the large bulbs, which show well above the surface of the ground. In this species the leaves, when they grow after the flower has finished, are packed tight together, and suddenly expand like the old-fashioned Japanese fans which delighted one's childhood.

The only other members of the Amaryllidaceae indigenous to this country are species of *Hypoxis*, of which *H. angustifolia* is the best known. This, though a little "weedy" for the garden, is a very cheery plant when in bloom, with lots of bright golden stars, which continue for a very long time. *H. urceolata* is larger, with hairy leaves, and several others, mostly smaller, such as *H. engleriana* var. *Scottii*, *H. villosa*, *H. gregoriana*, and *H. obtusa*, are found in different districts. This completes the list of native Amaryllidaceae at present, but it must be remembered that Kenya Colony is still so "new" that its Flora is by no means yet entirely classified; new species are continually being found, and the Botanist of the Coryndon Memorial Museum at Nairobi is being kept constantly busy by specimens sent in from all over the Colony.

When we turn to the "exotic" side, and consider the imported Amaryllidaceae grown in our gardens, the same fact must be remembered, that this is a "new" Colony. Forty years ago most of it was a savage country and during the dozen or so years before the War, it was only a few very keen people who had the time and energy to make gardens, and the real "spate" of gardening has only come since the War. Gardening is still almost entirely an amateur's hobby, nurserymen are few, paid white gardeners fewer, and the native garden boy is more interested in edible plants than in flowering ones. The country has infinite possibilities—a rich soil, a wonderful climate where it is never really cold, except at the higher altitudes, and never unduly hot; in Nairobi, for example, at 5,500 ft., the shade temperature does not go above 85° or below 45° F. The fact that there is no winter makes the propagation of bulbous plants from seed a more rapid matter than in colder countries, and as *Lilium* bulbs grow to a very large size in a very short while, it is likely that *Hippeastrums* would do likewise, but seed of the better strains of these is neither easy to come by nor cheap to buy. Of the cultivated bulbs grown in gardens, the true *Amaryllis*, *A. belladonna*, and its varieties, only do well at over 7,000 feet, refusing to flower lower down. *Hippeastrums* on the contrary are magnificent nearly everywhere, grown in the open ground with no trouble at all.

The species, such as *H. equestre* and *H. pratense*, do just as well as the hybrids. The imported *Crinums* flourish as happily as the indigenous ones, and *C. powellii* and its var. *album*, *C. capense*, and *C. longifolium* are among those established in the country.

Clivias do well in some places, and flower splendidly, but are more difficult to cope with, requiring special root-confining beds if grown in the open ground. *Eucharis grandiflora* is perhaps most successful as a pot plant on a veranda, but also grows and flowers planted out in shady places. A few *Bomareas* are being grown; *B. lehmannii* is so far the most successful, producing its orange-spotted flowers very freely. *Hymenocallis tubiflora*, the "Spider Lily", is very popular and grown in every garden; *H. littoralis* grows well, and so does *H. Calathina*. *Narcissus* in many forms grows and flowers freely at 8,000 feet and over, but is useless at lower altitudes.

Nerine undulata is the only member of its family to do well and persist, and is a very charming little bulb producing its pink flowers in quantity whenever there is much rain.

Another particularly successful bulb is *Sprekelia formosissima*, which increases at an amazing pace and is free with its wonderful flowers on and off the whole year through. It is quite one of the most beautiful of garden plants, and one of the most decorative for cut flower work. Two colour varieties are grown, one a deeper crimson than the other, besides the rarer pale red flowered *S. karwinskii*.

Vallota purpurea is magnificent at the higher altitudes, but sulks under 6,000 feet. *Zephyranthes* luckily are better tempered, and *Z. atamasco*, *Z. carinata*, *Z. rosea*, *Z. ajax*, and a deeper yellow one with the suggested name of *Z. flava*, but which might be *Z. texana* or *Z. aurea*, are all grown, and all do well. The sub-genus *Cooperia* has not so far reached us, but should do well, judging by the description in the 1934 Year Book.

Chlidanthus fragrans is growing and blooming happily in at least two parts of the country, and is increasing so fast that it will soon spread further; while *Bravoa* and *Beschorneria* are both on trial and have so far done hopefully. The *Cyrtanthus* group is with us in many coloured varieties, and doubtless in time we shall procure a greater number of species from South Africa; they are charming plants, and the freshness of their scent is particularly pleasing.

The First National Amaryllis Show at Orlando, Florida, April 3-4, 1934

The first National Amaryllis Show sponsored by the American Amaryllis Society has passed into history and marks a milestone in the advancement of this high quality flower in popular favor in America. The Show was held in cooperation with the Annual Florida Amaryllis Fiesta in an appropriate sub-tropical setting, the utterly beautiful city of Orlando, in the charming lake region of Orange County, April 3 and 4, 1934.

The Show was opened to the public in the Chamber of Commerce Building at noon and more than five thousand visitors attended during the first day. This was increased to a total of over 15,000 at the end of the second day.

The Show was managed by Mr. I. W. Heaton, Chairman of the Exhibition and Awards Committee, assisted by Mr. Wyndham Hayward, Secretary, and Mrs. E. G. Wheeler.

Among the first to visit the show was Mayor S. Y. Way, followed by the City Commissioners, and practically the entire membership of the nine Orlando Civic Clubs, and the Greater Orlando Chamber of Commerce. Many out of State visitors viewed the exhibits, including Mr. Cornelius Zandbergen of New York; Mr. and Mrs. Robert Wayman of New York; Miss Mary Yates, past president of the Ontario Horticultural Society of Toronto. Members of the Society resident in Florida were much in evidence including Dr. A. E. Conter of Appalachicola; Mesdames J. H. Churchwell and W. E. MacArthur of Jacksonville; Mrs. W. W. Owens of Frostproof; Mr. J. A. Peterson of Lakeland; Mrs. W. G. Tilghman of Palatka; Mr. Frank Vasku of Winter Park; Mr. and Mrs. E. G. Wheeler; Pres. and Mrs. E. G. Duckworth; Mr. T. P. Robinson of Orlando; Mr. and Mrs. Arthur R. King of Zellwood; Mrs. B. A. Dominick of Conway, and many others.

The guest of honor at the Show was Mr. Theodore L. Mead of Oviedo. Mr. Mead has been elected a Fellow of the Society in recognition of his meritorious work in Amaryllis hybridizing. The Society will honor him further by dedicating the 1935 Year Book to him. Mr. Mead is in the 80's but he is still active in mind and body. Mr. Mead made a profound pronouncement after viewing the Show. In his opinion the future development of the amaryllids is bound up primarily with their propagation by cuttage, a viewpoint which was endorsed by other prominent visitors at the Show.

The show included more than 10,000 blooms. Exhibits were received from Mr. Richard Diener of Oxnard, California; the U. S. Department of Agriculture, Washington, D. C. and from the growers in various sections of Florida.

The writer was appointed to judge the Show which turned out to be a very difficult task. The tentative standards adopted by the Society were put to the severest test. The classes in which the writer had entries were judged by Mr. Wyndham Hayward.

The practicability of shipping amaryllis blooms great distances was demonstrated. The U. S. Department of Agriculture blooms were received in bud on April 1st and were immediately set up in water. They were in full bloom by the morning of April 3 and in perfect condition. The Diener blooms were sent by express on account of the uncertain condition of the air mail service. They arrived at noon of April 3. The flowers were somewhat dehydrated and were laid in the cool fountain for an hour. By late afternoon the flowers were beginning to open. All buds which were not too far advanced when the scapes were cut opened normally. In future national shows there is no reason why there should not be complete exhibits from all the chief growers.



Florist's Exchange

Hybrid Hippeastrum: President Roosevelt

The best bloom at the First National Amaryllis Show. Variety introduced by I. W. Heaton, 1934.

The exhibits were grouped according to the Fischer Color Chart under the tentative classification of flower types. This chart is not entirely perfect for Amaryllis colors but is without doubt one of the greatest aids in popularizing intelligent color descriptions. The Society owes a debt of gratitude to the New England Gladiolus Society for making this chart available.

The entries were arranged in tiers on two sides of the 50 x 40 lobby with two tables at the two other sides of the room, and one at each side of the fountain in the center. The decorations were beautifully executed by Mrs. Arthur R. King and Rev. and Mrs. J. W. Ischy. The pots were covered with *Asparagus plumosus* and Spanish

Moss. The backgrounds were built up with potted palms, and brilliant cut amaryllis blooms were used with great abandon.

The number of entries was far greater than was expected which necessitated crowding. This was the only noticeable defect in their arrangement. This was hardly noticed for the whole presented a riot of color and cheerfulness.

The flower types represented included the *Psittacinum*, *Equestre* and *Leopoldi* for hybrid *Hippeastrum*; The *Solandriflorum* type was not in evidence. *Crinum* Lily, Zephyr Lily, Polyanthus *Narcissus* as well as *Hippeastrum* species were also shown.

The *Equestre* type classes were fully represented, but not so the *Psittacinum* and *Leopoldi* classes. Blooms of the Nehrling-Mead and Heaton Strains were shown in great abundance, and the U. S. Department of Agriculture, Diener and Peterson Strains were represented to a sufficient extent to make comparisons possible. The Nehrling-Mead Strain as exhibited at the Show was rich in reds, dark reds, darker reds and orange reds. Pale, lighter and light reds were relatively scarce. This led to a lack of balance in the effect. The reds, many of them not especially good, gave the impression of lack of care in selection. This was especially true in contrast with the delicate and refined reds found in the U. S. Department of Agriculture and Diener Strains. The Heaton Strain contained some striking dark reds and orange reds of great brilliance as shown in the variety, *President Roosevelt*. The Peterson Strain which is an American selection of the Veitch hybrids contained some unusual patterns and fine color shades.

The best pure white variety was in the U. S. Department of Agriculture display. The two Nehrling-Mead whites were smaller by comparison. The so-called yellow entries were a disappointment. These were all of a greenish-yellow and really not beautiful. This points to the desirability of importing for the hybridizer from Brazil the species *Hippeastrum rutilum citrinum* which is reported as bright yellow.

The greatest range and the most refined shades of color are found in the U. S. Department of Agriculture Strain,—from pure white, thru white with red markings, to cerise, bright and dark red, vinous red and copper-gold. Bright orange, a color quite characteristic of the Nehrling-Mead Strain, was not included in the display exhibited by the Department.

The Diener Strain is notable for clean, brilliant colors.

The first prize for the best display went to the U. S. Department of Agriculture with 94 out of a possible 100 points; the second and third prizes to I. W. Heaton and Richard Diener; and honorable mention to J. A. Peterson.

First Class certificates were awarded to the U. S. Department of Agriculture, Nehrling-Mead, Heaton and Diener Strains.

The variety, *President Roosevelt*, propagated by cuttage and exhibited by I. W. Heaton, was designated the best bloom of the *Leopoldi* (*Reginae sub-type*); No. 6, vinous red with darker throat, exhibited by the U. S. Department of Agriculture, was chosen as the best bloom of the *Equestre* type; a white copiously dotted red, shown by I. W. Heaton, was selected as the best of the *Psittacinum* type.

First class certificates were awarded for several hybrid amaryllis; *Hippeastrum equestre major*; *Hippeastrum rutilum fulgidum*; *Crinum asiaticum*; *Crinum longifolium*; Burbank Hybrid *Crinum*; *Zephyranthes treatiae* and *Narcissus tazetta*, *Grand Monarque*. The grand award for most points went to I. W. Heaton.

The three outstanding facts brought out by the Show are a demonstration that there is a lively interest in the amaryllids; that cut bloom can be sent safely great distances and that the future development of Amaryllaceae lies in propagation by stem cuttage.

SECTION A. AMARYLLIS (*Hippeastrum*)

Class 1. Species. *Hippeastrum equestre major*—1st. Mrs. J. L. Anderson, 2nd. Frank Vasku, 3rd. Wyndham Hayward.

Hippeastrum rutilum fulgidum—1st. Hamilton P. Traub.

Hippeastrum johnsonii—1st. Mrs. D. T. Knappenberger.

Class 3. Best collection of 5 to 10 named Grandiflora varieties—1st. I. W. Heaton, *President Roosevelt*, *Edward Hall*, *Eola*, *Orlando* (white with lighter red markings) and *Rosemarie* (lighter red with yellowish star).

Class 5. Best Display—1st., U. S. Dept. of Agriculture, 94 points out of a possible 100; 2nd. I. W. Heaton; 3rd. Richard Diener; Honorable mention: J. A. Peterson.

Class 6. Best blooms in the Show—(Hybrid Amaryllis)
Psittacinum type: I. W. Heaton with *Ridgewood*, white minutely dotted with red.

Equestre type: U. S. Dept. Agriculture, with an unnamed variety, a clear vinous red with darker red throat.

Leopoldi type: I. W. Heaton with *President Roosevelt*, deep orange red with a delicate white star in center.

Hippeastrum species: Mrs. J. L. Anderson for *H. equestre major*.

STANDARD GRANDIFLORA VARIETIES

PSITTACINUM TYPE:

Class 138. Red—1st. I. W. Heaton, *Ridgewood*.

EQUESTRE Type:

Class 161. White without markings—1st. I. W. Heaton, 2nd. H. E. Searles.

Class 162. White with light markings—
 1st. I. W. Heaton, 2nd. No award, 3rd. Frank Vasku.

Class 163. Yellow—
 1st. No award, 2nd. I. W. Heaton, 3rd. No award, Honorable mention, Arthur King.

Class 164. Orange—
 1st. Arthur King, 2nd. No award, 3rd. Mrs. B. A. Dominick, Hon. mention, I. W. Heaton and J. W. Ischy.

Class 165. Pale Red—
 1st. Hamilton P. Traub, "*Bert Merrill*", 2nd. I. W. Heaton, 3rd. No award, Hon. Mention, Mrs. B. A. Dominick.

Class 166 (a) Lighter Red—
 1st. I. W. Heaton, 2nd. D. E. Anderson, 3rd. No award, Hon. mention, Mrs. B. A. Dominick.

Class 166 (b) Lighter red with white star—
 1st. E. A. Peterson, 2nd. I. W. Heaton, 3rd. J. W. Ischy, Hon. mention, Arthur R. King and D. E. Anderson.

Class 166 (c) Lighter red with white stripes—
 1st. J. A. Peterson.

Class 167. Light red—
 1st. I. W. Heaton, 2nd. No award, 3rd. No award, Hon. mention, E. A. Peterson and D. E. Anderson.

Class 168 (a) Red—
 1st. I. W. Heaton, 2nd. Arthur R. King.

Class 168 (b) Red with large white star—
 1st. Mrs. Frank Spreen.

Class 168 (c) Red ruffled—
 1st. I. W. Heaton.

Class 169. Dark Red—
 1st. Mrs. B. A. Dominick, "*Anne Lindbergh*", 2nd. J. W. Ischy, 3rd. I. W. Heaton.

Class 170. Darker Red—
 1st. I. W. Heaton, 2nd. No award, 3rd. H. E. Searles, Hon. mention, E. G. Duckworth.

LEOPOLDI TYPE:

Class 192. White with light markings—
 1st. Frank Vasku.

Class 196. Lighter Red—

1st. Mrs. B. A. Dominick, "*Eleanor Roosevelt*."

Class 198. Red—

1st. I. W. Heaton.

FIRST CLASS CERTIFICATES FOR HYBRID AMARYLLIS:

Strains—

Richard Diener; U. S. Department of Agriculture; Theodore L. Mead; I. W. Heaton.

Hybrid Varieties—

Richard Diener, one unnamed variety. U. S. Dept. of Agriculture, No. 1—pure white; No. 2—bright red with white star; No. 3—white with cerise lines; No. 4—white minutely dotted & striped red; No. 5—Copper-gold.

I. W. Heaton, nine certificates including the varieties, *Eola*, *Edward Hall*, and *President Roosevelt*.

Hamilton P. Traub, one named variety, "*Bert Merrill*."

D. E. Anderson—one unnamed variety.

E. A. Peterson—one unnamed variety.

Mrs. B. A. Dominick, two named varieties—"Eleanor Roosevelt," and "*Anne Lindbergh*."

J. W. Ischy—one unnamed variety.

J. A. Peterson—two unnamed varieties.

Frank Vasku—one unnamed variety.

Wyndham Hayward—one variety of Howard and Smith Strain, an unusual strawberry red.

Mrs. W. G. Tilghman—three named varieties—"Palatka," a 9½ inch bloom; pink & white; "*Helen Tilghman*," an 8 inch, red with white star; and "*Helen Jane*," a clear light red.

Species—

H. equestre major—Mrs. J. L. Anderson; *H. rutilum fulgidum*—Hamilton P. Traub.

SECTION B. CRINUM LILY (*Crinum*)

Class 501 (a) *Crinum longifolium rosea*—1st. Mrs. Eliza V. Baker.

Class 501 (b) *Crinum longifolium alba*—1st. Theodore L. Mead.

Class 501 (c) *Crinum virginicum*—1st. Theodore L. Mead.

Class 501 (d) *Crinum amabile*—1st. Mrs. Susie Mathews.

Class 501 (e) *Crinum asiaticum*—1st. No award; 2nd. Wyndham Hayward.

Class 501 (f) *Crinum hybrid (Burbank)*—1st. Mrs. W. W. Owens.

Class 503. Best bloom in show—Mrs. W. W. Owens, *Burbank Hybrid Crinum*.

First Class Certificates—*Burbank Hybrid Crinum*—Mrs. W. W. Owens.

SECTION C. ZEPHYR LILY (*Zephyranthes*)

Class 603, Best bloom, Hamilton P. Traub, *Z. treatiae*, from the Suwannee River of Florida.

Class 651, White, Hamilton P. Traub, *Z. treatiae*.

Class 656, Light red, 1st. No award. 2nd. Wyndham Hayward, *Z. carinata*.

First Class Certificate—*Z. treatiae*, Hamilton P. Traub.

SECTION D. NARCISSI AND RELATIVES (*Coronatae*)

Class 1003. Best bloom in any Genus—Bennie Green, *Narcissus tazetta*, *Grand Monarque*.

Class 1077 (b) *Grand Monarque*—1st. Bennie Green.

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Awards of Merit for floral arrangement of Amaryllis were given to Rev. and Mrs. J. W. Ischy and Mrs. Arthur R. King.

The Grand Prize for most points was awarded to I. W. Heaton.

Orlando, Fla.
April 5, 1934.

HAMILTON P. TRAUB.

A Visit to the First National Amaryllis Show

MRS. W. E. MACARTHUR, *Florida*

The Amaryllis joins the garden aristocrats for belated, coveted honors, and its value as a show flower has been successfully demonstrated by the Second National Amaryllis Show, and the Second Southeastern Amaryllis Show under the auspices of THE AMERICAN AMARYLLIS SOCIETY.

Orlando, Florida had the unique distinction of putting on the First National Amaryllis Show, April 3 and 4, 1934 in the fine Chamber of Commerce Building which provided an ideal setting for this amazing assortment of masterpieces of the hybridizers wonderful achievement of color and form in this special class of plant life. The result was extremely effective.

Particular attention was paid to the art of placing the amaryllis with regard to color and form so as to provide an attractive ensemble of carefully blended shades of the rare white through the exquisite pinks to the crimson velvety open-faced beauties arranged in stately rows on both sides of the building presenting a gorgeous display of the best strains of hybrid amaryllis in this Country for the delight of thousands of interested amaryllis enthusiasts and all flower lovers in general.

These sun-worshipers, showing few leaves make ample amends by their profusion and reliability of bloom, their range and brilliancy of color, the certainty of performance, the length of time these gorgeous beauties continue to bloom, the keeping quality, and the ease of cultivation. All of these qualities make them valuable acquisitions to the home garden and the commercial grower.

In viewing this glorious all-Amaryllis show, forceful realization of the great amount of tedious, meticulous work done by hybridizers to bring these marvelous creations to a standard of perfection was acknowledged by fifteen thousand enthusiastic spectators.

Probably no exhibit created more wonder and excitement than the pure white amaryllis exhibited by the United States Department of Agriculture.

A special feature of the show was the air-mail delivery of specimens of the famous Diener strain of amaryllis which were placed to share honors with their Florida relatives, none the worse for their long journey across the United States.

Usually the outstanding feature of a show of this magnitude is difficult to judge but spectators and judges were unanimous in their approval of the new varieties—"President Roosevelt," (Heaton, 1934) and "Eleanor Roosevelt" (Dominick, 1934).

The kinds of flowers, that lend themselves to the staging of a show in their sole honor and which remain a major attraction for two days to thousands of interested spectators, are limited. Therefore, the value of the amaryllis especially as a Florida and California show feature simply cannot be estimated too highly.

The 1935 National Amaryllis Show at Montebello, California

E. P. ZIMMERMAN, *California*

The 1935 or Second Annual National Amaryllis Show of the American Amaryllis Society was held at Montebello, Calif., on the premises of the Howard & Smith nursery establishment, April 12-14. As one approached the immaculately-kept lawn, colorful beds of flowers greeted the visitor in front of the main administration building, while stately rows of Cocos Plumosa palms waved their leaves.

The show brought out an attendance of more than 25,000 on the three days, and opened in brilliant sunshine after several weeks of cloudy weather. At the entrance to the patio on both sides of the buildings were groups of cinerarias, some of them with flowers five and six inches in diameter. Both flowers and plants indicated a high standard of culture.

At the base of the Cocos palms, near the flagstone walk, were beds of novelty colors of geraniums, contrasting with the other flowers in the landscape scheme. Against the outside wall of the patio were two tables, six by ten feet, upholding some 120 potted hybrid amaryllis (*Hippeastrum*) plants in full bloom, some with four to six flowers on two stalks. These were tastefully arranged with maidenhair fern edgings.

Stepping inside, through the door into the showrooms, a bowl of 20 large flower-scapes of snow-white, perfect blossoms, admirably arranged, was the most immediately arresting display. These were hybrid amaryllis from the plantings of Richard Diener, Oxnard, California, internationally known plant breeder and seedsman. This bowl received a first prize. On both sides of the bowl were Howard & Smith exhibits of sixty pot plants of choice hybrids, in all shades, with blooms from 6 to 10 inches in diameter. These were displayed on tables six by eighteen feet, and the borders of the tables were neatly edged with three-inch pots of Bird's Nest Fern (*Asplenium Nidus-Avis*). This display also received a first prize in its class.

To the left against the wall and also on a settee in the center, there were other groups of amaryllis, mostly in shades of red. On the right was a display of 100 plants in six-inch pots on a terrace-like table against the wall. Among these amaryllis plants was one with two bloom stalks, four eight-inch blooms to the stalk, of a perfect dark rose color rarely seen in hybrid amaryllis. The judges awarded this bloom the first prize for outstanding color. The competition in this class was keen, and the choice of the judges difficult, as a high standard was evident in all the exhibits.

Grouped around a column at the right was the display from the Washington, D. C., greenhouses of the Bureau of Plant Industry, United States Department of Agriculture, which arrived by air mail. The colors, and shapes of the flowers were distinctive and unusual. This display was credited with an award of merit.

In the center of the show room, opposite the entrance, there was a well arranged display by Richard Diener, on a table 10 feet wide and 30 feet long, with a thousand flower spikes of amaryllis in vases. The spikes had from two to four flowers, in various shades, and some of the blooms ranked with the largest in the show, being 10 inches in diameter across the face. This table received the award of first prize for hybrid amaryllis as cut flowers.

On the same table to the right was a small display of hybrid crinum blooms on cut spikes, shipped by air mail from Winter Park, Florida, by Wyndham Hayward. These arrived in good condition and gradually opened during the Show. The pink-flowered hybrid "Cecil Houdyshel" was much admired. The display received an award of merit. Maidenhair and Bird's Nest ferns were an added decoration at this table.

On the right again, around the column from the United States Department of Agriculture group, was an exhibit from the Heaton Bulb & Palm Co., of Orlando, Florida, also sent to Montebello, by air mail. The blooms were newly opened, and seemed as if they had been just cut in the greenhouse. Their fine appearance was an indication that long distances mean little in shipping cut amaryllis blooms, and that every city in the country could be supplied with the spikes in season without difficulty.

At the same location were two exhibits of cut blooms of fine hybrid Amaryllis, entered by Mrs. Emma M. Foster, of Covina, Calif., and Mrs. J. H. Linkletter, of Whittier, Calif. One stalk of flowers in Mrs. Linkletter's exhibit was outstanding, with four flowers 10 inches in diameter, of an attractive purple color, which drew the attention of every visitor to the Show. Mrs. Linkletter won first prize for amateurs.

Above in the alcove of the show room were numerous potted Amaryllis in niches in full blooming splendor. To the right toward the office a table-like terrace, 6 by 24 feet, had been arranged with a handsome display of some 100 potted plants of the best-selected Howard & Smith blooms. In this group was a plant with two flower scapes, and four 10-inch blooms to a spike wide open. The flowers were of a dark brownish red, rarely seen in hybrid amaryllis, and shading to nearly black at the base of the petals. This exhibit won a first prize.

The verdict of all show attendants was that the 1935 National Show had brought together the finest assemblage of choice hybrid amaryllis in the history of horticulture on the Pacific Coast. Real credit for the success of the event belongs to Mr. Fred H. Howard and Mr. Richard Diener, veteran plant breeders and hybridizers

both, with a world-wide reputation in other plant fields, but both having a strong fancy for the finest hybrid amaryllis. As the result of 30 to 40 years of continuous selection and breeding, these two Californians have developed strains of high average quality, and with a stock of many thousands of blooming size bulbs, they are able to make a wide selection of the best types from all their seedlings for exhibition purposes. The result is "hard to beat."

Outside of his hybrid amaryllis, Mr. Howard is perhaps best known for his roses and the bi-generic cross *Amarcrinum howardii*. Mr. Diener has specialized on the giant-flowered double and ruffled petunias for many years. Mr. Diener was working under difficulties of weather conditions and distance in entering his exhibits at the 1935 Show, most of his stock being grown outdoors. The Howard & Smith exhibits were largely from pot plants forced in their own greenhouses.

On leaving the 1935 Show the visitor approached a long pergola bowered with climbing roses, bright yellow, dark crimson and pink, while brick red and magenta colored bougainvilleas also gleamed above. On the floor at both sides were additional thousands of flowering amaryllis pot plants in every possible shade of color, besides new creations in roses, not yet released to the public, in full bloom as potted specimens. Among these amaryllis sighted on the way out was one of rather spectacular coloring, a golden-salmon shade, beautiful beyond compare, and which should have been given a place of honor in the main Show, according to judgment of many fanciers.

The judges of the show were Mr. Donald James, Santa Barbara; Mr. E. O. Orpet, Santa Barbara; and Mr. E. P. Zimmerman, Carlsbad.

Fine Display of Amaryllis Wins Acclaim *

ZOLA V. COTTON

The 1935 National Amaryllis Show, held April 12, 13 and 14 in the administration building of the Howard & Smith Nursery, 1200 Beverly Boulevard, Montebello, was one of the finest floral displays ever held on the Pacific Coast, in the opinion of many Southland plant authorities.

A huge double red hybrid amaryllis, grown and exhibited by an amateur, Mrs. J. H. Linkletter of Whittier, and competing with thousands of other gorgeous blooms, was declared the best and largest flower in the show by three of the Southland's leading horticulturists acting as judges of the show.

In the array of exhibits by commercial and amateur growers from various parts of the United States, Mrs. Linkletter was also awarded the blue ribbon for the best collection of ten or more Grandiflora amaryllis.

FROM FLORIDA

A collection of compact amaryllis in the cut-flower display from Florida proved to be an attraction of the show. An unusual display of crinums, seldom seen on the Pacific Coast, but a decided favorite in the East, was awarded a first ribbon. These flowers were also from Southeastern States.

A large display of select blooms from the United States Department of Agriculture in Washington, D. C., received a ribbon of merit. The varieties had been produced by the Federal Department by scientific breeding methods.

All eastern exhibits were sent by airplane and were received in excellent condition.

The show, which was under the auspices of the American Amaryllis Society, was managed by Richard Diener of Oxnard and Fred Howard of Montebello and drew large crowds each day.

The judges who passed on the exhibits were Donald James, Santa Barbara; E. O. Orpet, Santa Barbara; and E. P. Zimmerman, Carlsbad.

* Reprinted from "Southland Homes and Gardens," April 28, 1935.

Sidelights on the Second National Amaryllis Show at Montebello, Calif., April 12-14, 1935*

C. E. Houdyshel—April 13, 1935.

"Perhaps the highest honor was won by Mrs. J. H. Linkletter, of Whittier, California, for the largest flower exhibited. It was probably also the best, for the form was excellent. It was a four flower umbel, and the color pure dark red. The open flower was quite flat across. This flower was quite double, having 10 petals. Mrs. Linkletter showed about five other varieties."

E. O. Orpet—April 18, 1935.

"Howard & Smith must have had 10,000 flowers open not only at the show but in the other greenhouses and show places. I never saw such a display of all good kinds and perhaps never will again. There were some pink shades they are working up that are very promising. The best flower in the show (professional exhibits) was one of a decided deep rose shade, wonderful form, in Howard's exhibit."

Richard Diener—April 19, 1935.

"The Amaryllis show has come and gone and was a very good show. Most of my Amaryllis were outdoors and on April 7 we had two inches of rain in twenty-four hours. Monday morning I went out and looked at the Amaryllis and they appeared as if hail had gone through them and there was not a single bud in shape. I immediately cut all the buds that might have had a chance to open out by the time of the Show (April 12-14). I placed them in pails in the greenhouse and let it get as hot as possible. By the 11th we had a nice bunch in shape . . . The Show made a great hit with all who attended."

D. M. Falconer—April 30, 1935.

"The Show was very successful, from the standpoint of attendance . . . We estimate that between twenty and twenty-five thousand people attended the Show and it received very favorable comment from everyone."

Fred H. Howard—May 9, 1935.

"It was a very successful Show from every standpoint except that the number of exhibitors was limited. It is estimated that on the three days we had some twenty to twenty-five thousand people through the buildings. Cars were parked for half a mile on either side of the nursery on the boulevard, and at certain periods the congestion in the main lobby was very bad, but we handled it in good shape . . . The display as a whole was magnificent and I do not believe there was a single criticism made by anyone of the people who saw it. We had our own stock in the neighborhood of some 2,000 selected plants in pots. Mr. Diener brought down a truck load of cut Amaryllis but no pot plants."

* * * —May 20, 1935.

"There is no doubt about the success of the Show. It was acclaimed in all quarters."

* Excerpts from letters received by the Secretary, Mr. Wyndham Hayward.

Southeastern Regional Amaryllis Show, Orlando, Florida, April 3-5, 1935

WYNDHAM HAYWARD, *Florida*

The 1935 Southeastern Regional Amaryllis Fiesta and Exhibition of the American Amaryllis Society was held in the Orlando, Florida, Chamber of Commerce Building April 3-5, and the estimated attendance for the three days was 15,000. From all parts of the state came the exhibitors and spectators, and acclaimed the quality of the blooms on display as vastly superior to those shown the year before.

The number of blooms was less than the year before, due to unseasonable warm weather. Among the features of the Show were a table of 24 named varieties displayed by an Orlando firm, the Heaton Bulb & Palm Company, a large exhibit of choice blooms from the Washington greenhouses of the United States Department of Agriculture, entries of various *Zephyranthes*, pure white types of hybrid Amaryllis, and double-flowered Amaryllis. I. W. Heaton of Orlando was manager of the Fiesta.

The Fiesta was held with the cooperation of the Greater Orlando Chamber of Commerce, and proved again an outstanding winter visitor attraction. In 1936 the Southeastern Regional show will be combined with the National Amaryllis Show for the year. Mayor V. W. Estes, the City Commissioners, and leading horticultural authorities and flower fanciers were honored guests at the exhibition during the three days. Many bulb specialists from distant points made special trips to Florida to see the latest progress in hybrid Amaryllis developments. The grand award of the Show to the winner of the most points was awarded to the Heaton Bulb and Palm company. Final awards in the classes were made by a committee of judges headed by Dr. Hamilton P. Traub of Orlando, assisted by a committee including Mr. Knowles A. Ryerson, A. R. King, I. W. Heaton, E. G. Duckworth, W. Hayward and J. W. Ischy. Judges were not allowed to act in any classes in which they had entries.

Awards

Best bloom in show: Heaton Bulb & Palm Co.; Best Bloom in Leopoldi class, first, Mr. Heaton; second, Mr. Heaton. Best Bloom in Reginae A. class, first, Mrs. W. G. Tilghman, Palatka. Best Bloom in the Reginae B. Class, First, Mr. Heaton.

Awards of Merit: to Mr. Heaton for display of 24 named varieties of hybrid Amaryllis; to U. S. Department of Agriculture for display of hybrid Amaryllis from Washington, D. C.

First Class Certificates: to all winners in "best bloom" classes; U. S. Department of Agriculture exhibit for color; John Springer, Orlando, Fla., for display of original Mead strain blooms; John Springer, for display of double-flowered *Hippeastrum equestre alberti*; W. Hayward, Winter Park, for display of most species of Amaryllis family; Mr. and Mrs. John W. Ischy, Windermere, Fla., for arrangement and display of hybrid Amaryllis; 17 certificates to Mr. Heaton for new seedlings; Mrs. J. A. Sewell, Winter Park, for *Hippeastrum equestre major*; Harry E. Searles, Orlando, for one variety; Mrs. W. G. Tilghman for two varieties; John W. Ischy for two varieties; W. Hayward for three varieties; W. Hayward for hybrid *Crinum "Cecil Houdyshe"* exhibit; Arthur R. King, for *H. equestre* hybrid bloom; Frank Vasku, for one variety; Marinello Shop, Orlando, for exhibit of *Eucharis grandiflora*.

Individual Class Awards Were:

Reginae Type A, compact petals—Class 303, white with lighter red markings, first, Mr. Heaton; Class 317, lighter red to light red without markings, first, Mrs. W. G. Tilghman; second J. W. Ischy; third, A. R. King; Class 319, lighter red to light red with distinct markings, first, Mr. Heaton, second Mrs. W. G. Tilghman; third, W. Hayward. Class 320, red without markings, first, Mr. Heaton. Class 321, red with slight markings, first A. R. King; second Mr. Heaton. Class 322, red

with distinct markings, first, Mrs. W. G. Tilghman; second, Mr. Heaton; fourth, Mr. Hayward. Class 325, violet red, first, Mr. Heaton.

Reginae type B, pointed petals—Class 401, white without markings, first, Dr. H. P. Traub; second, Frank Vasku; third, H. E. Searles; fourth, Mrs. W. G. Tilghman. Class 402, white with slight pale red markings, first, Frank Vasku; second, Mr. Heaton. Class 403, white with slight red markings, first, Mr. Heaton; second, Frank Vasku; third, D. E. Anderson; fourth, Peterson & Riedel. Class 404, white with light red stripes, etc., first, W. Hayward; second, H. E. Searles. Class 407, yellow with markings, third, J. W. Ischy. Class 411, orange without markings, first, Mr. Heaton; second, J. W. Ischy. Class 412, orange with light markings, first, A. R. King; second, Mr. Heaton. Class 413, orange with distinct markings, first, Peterson & Riedel; second, D. E. Anderson; third, Albert Stuckie. Class 414, pale red without markings, first, Mr. Heaton. Class 415, pale red with light markings, first, Mr. Heaton, second, Mrs. Tilghman; fourth, Peterson & Riedel. Class 416, pale red with distinct markings, first, Peterson & Riedel, second H. E. Searles; third, Albert Stuckie. Class 417, lighter red to light red without markings, first, Mr. Heaton; second, Peterson & Riedel. Class 420, red without markings, first, Mr. Heaton; second, Mrs. W. G. Tilghman. Class 421, red with slight markings, first, Albert Stuckie. Class 422, red with distinct markings, first, J. W. Ischy; second, D. E. Anderson; third, Mr. Heaton. Class 423, dark red, first, Peterson & Riedel; second, A. R. King; third, Frank Vasku; fourth, H. E. Searles. Class 425, violet red, first, Mr. Heaton. Class 429, violet red with markings, first, Mr. Heaton. Class 430, light violet red, first, Mr. Heaton. Class 431, dark red novelty, first, Mr. Heaton.

Leopoldi types A and B—Class 501, white without markings, first, W. Hayward; second, Mr. Heaton. Class 503, white with lighter red markings, first, Mr. Heaton. Class 514, pale red without markings, first, Mrs. W. G. Tilghman. Class 523, dark red, first, Mr. Heaton. Class 524, darker red, first, Mr. Heaton. Class 526, rainbow, pale red type, first, Mr. Heaton. Class 529, dark red novelty, first, W. Hayward.

Hippeastrum species, *Johnsonii*, first, Frank Vasku; second, W. Hayward; *equestre*, first, Mrs. J. A. Sewell, Winter Park; second, W. Hayward; *H.equestre alberti*, (double-flowered) first, John Springer; Crinum species, first, *Crinum Asiaticum*, Mrs. John List, Winter Park; second, *Crinum amabile*, W. Hayward; *Crinum* hybrids, first, W. Hayward, for "Cecil Houdyshel." Other species, *Sprekelia formosissima*, first, W. Hayward; *Chlidanthus fragrans*, first, W. Hayward; *Zephyranthes treatiae*, first, Dr. H. P. Traub; *Cooperia pedunculata*, first, W. Hayward; *Eucharis grandiflora*, first, Marinello shop.

The 1934 and 1935 Amaryllis Shows of the Bureau of Plant Industry, U. S. Department of Agriculture

The twenty-first annual Amaryllis Show of the U. S. Department of Agriculture, which was held at the Department Greenhouses, Fourteenth Street and Constitution Avenue, N. W., Washington, D. C., was opened March 26, 1934. The public was admitted from 9:00 a. m. to 9:00 p. m. daily through April 2 when the show closed at 9:00 p. m. The display was viewed by 19,840 people.

The exhibition comprised 1,200 amaryllis bulbs, each of which bore two or three flower stems with from two to seven flowers on each stem. The result was that there were displayed several thousand flowers ranging in color from dark velvety red through various shades of red, pink, orange, yellow-orange and striped types to pure white. The bulbs were arranged in the exhibition house of the Department Greenhouses on two side benches and on a center elongated pyramidal staging. Small pots of *Vinca major*, with rounded grey-green leaves edged with white, were placed between the pots of amaryllis to form a pleasing combination with the pointed dark green leaves, thick silvery green flower stems and clear bright blossoms of the amaryllis.

The Department's twenty-second annual Amaryllis Show was held from March 29 to April 5, 1935, inclusive, being open each day from 9:00 a. m. to 9:00 p. m.

The exhibition was attended by 28,325 visitors, some of whom travelled a long distance to see the display. Classes from public and private schools and members of garden clubs viewed the show in groups. Out-of-town, as well as local, florists and commercial growers were interested visitors.

The same general arrangement was followed for this exhibition as for the one of the previous year. Several large pots, each containing a group of bulbs in flower, were placed along the ridge of the center staging to provide accent notes. The most striking of these was a pot with seventeen blooms which were a vivid scarlet-red with white stars in the throats of the flowers.

The bulbs in the Department's collection of amaryllis are hybrids resulting from many years of breeding conducted by Department of Agriculture experimenters since 1909 when twelve varieties were imported from England. The Amaryllis Shows are exhibitions of the results achieved by the Department in one of the many phases of its work to produce improved plant forms. Department workers with amaryllis have successfully endeavored to obtain longer stems, new shades and larger flowers. The white amaryllis was produced through successive selection and cross-pollination of striped flowers showing the most white. The 1935 exhibition contained flowers measuring eleven inches from tip to tip. Some of the flower stems were over two feet long. A group of seedlings, flowering for the first time this spring, revealed new subtleties of colors, particularly in the orange shades.

The Department has held an Amaryllis Show each year since 1912 with the exception of the years 1914 and 1915.

Amaryllids at the New York Flower Show 1935

At the 1935 New York Flower Show in March prizes to private growers were awarded for amaryllis (*Hippeastrum*), clivias and narcissi (on March 19) as follows—

Amaryllis (12 plants, one bulb in a pot) Mrs. Roswell Eldridge, Great Neck, L. I., first; Miss Marie L. Constable, Mamaronek, N. Y., second.

Amaryllis (6 plants, one bulb in a pot) Mr. J. P. Morgan, Glen Cove, L. I., first; Mr. Marshall Field, Huntington, L. I., second.

Clivia (Imantophyllum) (6 plants, not less than 8-inch pots) Mrs. W. R. Coe, Oyster Bay, L. I., first; Mrs. H. M. Tilford, Tuxedo Park, N. Y., second.

Clivia (Imantophyllum) (Specimen) Mrs. W. R. Coe, first; Miss Marie Constable, second.

Narcissi (in variety, large trumpet types, six 8-inch pots or pans) Mrs. C. R. Holmes, Port Washington, L. I., first; Mr. Samuel A. Salvage, Glen Head, L. I., second.

Narcissi Poetae (in variety, six 8-inch pots or pans) Mrs. E. Marshall Field, Syosset, L. I., first; Mrs. C. R. Holmes, Port Washington, L. I., second; Mr. Samuel A. Salvage, third.

Narcissi Incomparabilis (in variety, six 8-inch pots or pans) Mrs. Samuel A. Salvage, first; Mrs. C. R. Holmes, second.

Narcissi (all other types, six varieties) Mrs. C. R. Holmes, first; Mr. Samuel A. Salvage, second.

Some Notes on European Flower Shows

RUSSELL S. WOLFE, *South Carolina*

Official Delegate of the American Amaryllis Society

The Decennial International Flower Show at Heemstede, Holland this spring was an extensive affair and quite a complete education in the newest and best, and the old standbys of Holland Bulbs, and, their proper culture and uses.

The area covered by the flower show was 46 acres of outdoor plantings, Flora's Palace, 27,000 square feet, and the "Ware House" 8,600 square feet.

Mass plantings were arranged for the Main Section.

The crocuses and other early blooming bulbs, as well as most of the narcissi, were over when we arrived; but, the tulips were certainly in their prime and in numbers too great to estimate. There were 500,000 tulips in the space in front of the main hall. These were planted mostly in beds of separate varieties, and very artistically arranged for wonderful effect. Also the arrangements permitted of practical approach by those interested in obtaining names of varieties, everything being plainly marked.

Other outside plantings consisted of effective arrangements of bulbs along with other spring flowers and shrubbery in many and varied types of old Dutch gardens, rockeries, formal and informal plantings and borders.

In the Main Hall (or Flora's Palace) were shown the special exhibits of new or special varieties, mostly cut flowers, very artistically arranged. The show in the Main Hall was continually changing. We attended the opening of the fifth indoor show which was officially opened by the American Minister. Most of the exhibits were of gladioli, dahlias, roses, iris, and other forced flowers.

The Ware House (with glass roof only, no sides at all) was a treasure house of some 70,000 bulbs (mostly tulips) of 800 or more varieties, all new developments of the last ten years; a very valuable planting, worth more than \$250,000.

A rather thorough search of the entire show revealed no amaryllis and upon inquiry we were informed that amaryllids (*Hippeastrum*, etc.) were very beautifully displayed in Flora's Palace a short time previously and they had finished blooming.

The amaryllis exhibit was covered by articles in the *Gardeners' Chronicle* of March 30, 1935 and April 6, 1935.

In order to obtain information concerning the amaryllis in Holland, I visited two of the most famous growers—Messrs. Warmenhoven & Zonen at Hillegom and Van Tubergen's Nursery at Haarlem; where I was graciously received, shown over their plantings and given all information requested.

There were only a very few blooms left, but, those few had good style and some of Warmenhoven's showed a distinct curling of the petals at the throat creating a nice effect.

Messrs. Warmenhoven & Zonen specialize in amaryllis (*Hippeastrum*) hybrids; Messrs. C. G. Van Tubergen Ltd., in addition to the hippeastrums, have quite a number of other Amaryllids; some very rare types. Both firms issue catalogs listing the items grown.

The methods of propagation used are by seed and offsets. All the hippeastrums are grown inside under glass. The seeds are planted in raised beds or benches from June to August. Potted in December and January; pots being usually sunk in the beds or benches; size of pots being increased as the bulbs develop. The bulbs reach blooming size from seed in three years, and are usually flowered in 6-inch to 8-inch pots. A temperature of 70 degrees is used for forcing, after the bloom spike appears.

These firms both state that they have the hippeastrum hybrids in almost all range of colors, including pure whites.

These plantings were all in excellent condition and it was very interesting and entertaining to be shown the plantings by the Dutch growers.

To obtain further information concerning the hippeastrum in Holland I visited the Research Laboratory at Wageningen, where Miss Ida Luyten is doing some wonderful experimental work with bulbs.

Miss Luyten proved a most charming hostess. She stopped all of her work to very patiently show me and tell me about her experiments in detail, especially concerning the vegetative propagation of hippeastrum. Miss Luyten informed me that she is to publish an article in the American Amaryllis Society's Year Book giving her experiments in detail; therefore, the information received from her will not be included in my article. Miss Luyten is certainly doing some wonderful work, and should receive all encouragement and aid possible in the furtherance of her experiments.

The Hollanders seem very thorough and painstaking in keeping their plantings in a high state of cultivation and cleanliness and deserve the successful results obtained.

The Royal Horticulture Society's Chelsea Great Spring Flower Show in London was quite a sight to behold. After visiting this show all day long, I found that short time entirely too inadequate to take it all in. There were many thoroughly planted gardens of all kinds. All sorts and types of cut flowers, and many extensive

trade exhibits. There was one big circus tent just packed with orchids of all imaginable types.

The crowd of visitors was so great that it was very difficult to obtain much information from the exhibitors or stop long enough to properly view or study an exhibit.

There were quite a number of amaryllis (*Hippeastrum*) and kindred bulbs in the private and trade exhibits. There was one private exhibit that displayed quite a number of beautiful pure whites of fine form and style, in fact the best whites I have ever seen.

At the Royal Botanic Gardens, Kew, England, we had a very interesting and instructive visit. The Assistant Curator was good enough to show us and give us information concerning the amaryllis and kindred bulbs. It seems that there is very little variation in the growing of the *hippeastrum* hybrids in England from the method already mentioned in this article.

Interesting hybridizing work with the *hippeastrum*, and *clivia* is being carried on at Kew. There was a fine batch of *Clivia miniata* in various shades in bloom and they were a very effective sight. *Haemanthus katherinae* were blooming to perfection, as well as several types of *Clivia* (*gardneri*, *nobilis*).

Kew Gardens is a very wonderful place and could not be properly "covered" in any small article; and, I feel sure that much of the success of Kew Gardens is due to the efforts and ability of the Assistant Curator, Mr. Raffill.

Amaryllis Culture in the Pacific Northwest

HARRY L. STINSON, *Washington*

In many respects few regions are so favorable for general bulb culture as the Pacific Northwest, and under the able direction of the late Dr. David Griffiths, the bulb industry has made rapid progress, especially in the production of the hardier bulbs. Unfortunately the climate is a little too severe for the outdoor cultivation of the tender or half-hardy amaryllids.

Our growing season between frosts varies from one hundred and twenty to one hundred and thirty-five days. The autumn seasons are usually open and warm causing the half hardy bulbs to make rapid growth which is too succulent to withstand the freezing weather in January. Seldom do we have heavy snowfall except in the mountains, and when the thermometer does drop to 8° or 10° F. the ground is bare and no protection is afforded the tender growth.

The amaryllids as a group, are very little known with the exception of the narcissi which are grown by the trainload. In all probability the reason for the limited culture of the various members of the family is the lack of local advertising and display, and the scarcity of reliable cultural information for our climatic conditions. Another reason is possibly the long period between blooms during which the bulbs must be given special care.

In an attempt to gain some idea of the extent of general amaryllis culture we took a trip through the four Northwest states last summer. We found no extensive plantings anywhere along the line of travel.

Apparently none of the various kinds are listed by local seed and bulb dealers except *Amaryllis belladonna* which is offered in some of the chain stores. The people who pass the counter see the large bulbs and the attractive picture, in many cases, stop to buy. The clerk assures them that the bulbs are hardy and beyond that she cares nothing for the results as to bloom production or future sales. Many hundreds of bulbs are sold in this way but I have never seen or heard of a single one that ever lived to bloom.

Hippeastrum hybrids are more generally known, in a small way, by practically all leading florists; who apparently do not push their sale but use them mostly for the color they lend to their establishments. Mr. Dunlap of Rosaia's, in Seattle, states that they sell quite well if they are displayed and advertised as they

should be. The two best collections found are in Seattle,—one at the residence of Mr. W. L. Fulmer and the other at Volunteer Park Conservatory.

Alstroemeria aurantiaca was found in several places in Seattle, in Portland, Oregon; and on Vashon Island. In fact we saw a float decorated with them in a parade at Kent, Washington. The late Dr. Griffiths informed us that *A. Chilensis* is grown at Bellingham, Washington, and does splendidly there.

Clivia miniata is best represented in Volunteer Park Conservatory in Seattle, and is also found in private homes here and there. A few may be seen also in florist's collections.

Lycoris squamigera is seldom met with, although we heard of a grower in Weiser, Idaho, who was reported growing them on a large scale. I have not had the opportunity of verifying this report.

The hardier species of *Zephyranthes* are found more frequently. We find them in many rock gardens, and since Seattle is a city on hills, rockeries are in high favor. Here also are found various species of the hardy *Galanthus* and *Leucojum*. We have heard humors that species of *Sternbergia*, *Nerine*, *Vallota*, and a few other types have been seen, but nothing definite has been learned about them.

Since the Board of Directors has placed me on the Trial Collections Committee, we have added to our collection as rapidly as possible. To date we have growing either in the small greenhouse or in the open a number of species and hybrids. These are arranged below according to Dr. Hutchinson's system,—

ORDER	FAMILY	TRIBE	SPECIES
Liliales	Liliaceae	Hemerocallideae	1. <i>Hemerocallis</i> (named varieties)
Alstroemeriales	Alstroemeriaceae		2. <i>Alstroemeria aurantiaca</i>
			3. <i>A. lutea</i>
			4. <i>A. chilensis</i>
			5. <i>A. psittacina</i>
	Petermanniaceae		Not represented.
	Philesiaceae		Not represented.
Amaryllidales	Amaryllidaceae	Agapantheae	6. <i>Agapanthus umbellatus</i>
		Allieae	7. <i>Allium</i> (various species)
		Gillieseae	Not represented.
		Galanthaeae	Not represented.
		Amaryllideae	8. <i>Amaryllis belladonna</i>
			9. <i>Nerine sarniensis</i>
		Crineae	10. <i>Crinum</i> (seven species)
			11. <i>Vallota purpurea</i>
		Zephyrantheae	12. <i>Zephyranthes rosea, lutea</i> and <i>alba</i> .
			13. <i>Z. robusta</i>
			14. <i>Z. atamasco</i>
			15. <i>Sternbergia lutea</i>
			16. <i>Cooperia drummondii</i>
		Haemantheae	17. <i>Clivia miniata</i>
		Ixiolirioneae	Not represented.
		Eucharideae	18. <i>Hymenocallis</i> (two species)
		Eustephieae	Not represented.
		Hippeastreae	19. <i>Hippeastrum</i> (five hybrid strains)
			20. <i>Hippeastrum advenum</i>
			21. <i>Lycoris squamigera</i>
		Narcisseae	22. <i>Narcissus</i> (various varieties)

This is a short list but we hope to add to our Pacific Northwest Trial Collection as opportunity offers. Contributions for trial in our northern climate will be gladly received, and we also invite correspondence.



R. de Kersting

Hippeastrum solandriflorum

This is Solandriflorum Type A under the tentative classification on page 70;
for Leopoldi Type A see page 91.

Tentative Classification of Amaryllis (*Hippeastrum*) Flower Types for Exhibition Purposes

Revised for 1935 and 1936 shows: For exhibition purposes amaryllis shall be placed tentatively into the (1) Grandiflora, and (2) Miniature groups on the basis of the characters indicated below,—

GRANDIFLORA GROUP

The Grandiflora group is tentatively divided into the following subgroups,—

- A. Flowers distinctly drooping, tube long (over 3 inches long)
 - B. Tube very long (over 4 inches) *Solandriflorum Type A*
 - BB. Tube shorter (3 to 4 inches) *Solandriflorum Type B*
- AA. Flowers slightly upright, horizontal or slightly drooping, tube short
 - C. Tube narrow, (1 to 3 inches)
 - D. flower compact, *Reginae Type A*
 - DD. flower pointed, *Reginae Type B*
 - CC. Tube open (to 1 inch)
 - E. flower compact, *Leopoldi Type A*
 - EE. flower pointed, *Leopoldi Type B*

MINIATURE GROUP

The Miniature group is tentatively divided into the following subgroups,—

- A. Tube narrowly funnel-shaped, *Phychella Type*
- AA. Tube openly funnel-shaped, *Habranthus Type*

Classes and Awards (Prize Schedule)

At the annual National Amaryllis Show, and at other exhibitions, as voted by the Board of Directors, the Society will award its First Class Certificate for meritorious new and standard varieties; its award of merit; and its first, second, third and fourth prize ribbons, in the classes indicated below. Any money prizes offered shall be authorized by action of the Board of Directors.

Each species or varietal exhibit shall consist of one or more potted flowering plants, or one or more flower scapes up to and including 1938; after which date three potted flowering plants or three flower scapes shall be required in each case.

SECTION A. AMARYLLIS (Genus *Hippeastrum*)

- Class 1. Single entries of *Hippeastrum* species.
- Class 2. Best collection of botanical species and varieties.
- Class 3. Best collection of 10 or more Grandiflora varieties.
- Class 4. Best collection of 5 to 10 Grandiflora varieties.
- Class 5. Best collection of 5 or more Miniature varieties.
- Class 6. Best display.
- Class 10. Best bloom in Show.

STANDARD GRANDIFLORA AND MINIATURE VARIETIES

The score card, and Prize schedule follow on pages 71 and 72.

Score Card—Exhibition Type * Hybrid Amaryllis (*Hippeastrum*)

All flowers to be expanded in ½ or more direct sunlight.

Color Class No..... Exhibitor's No.....

Flower Type.....

CHARACTER TO BE SCORED	METHOD OF RATING	POSSIBLE SCORE
Color and texture	No flower of inferior color to be considered; the full 50 points to be deducted for major color defects; dark green in combination with medium and dark red is especially objectionable.	50
Form	Except in the case of Solandriflorum types, preference is to be given to flowers with regular petals; the typical amaryllis flower shape however is to be recognized by allowing from 5 to 10 points depending on the merits of each particular case.	15
Size	Except in the case of Solandriflorum types, the following shall rule (diameter across face): 6" to 7", allow 5 points; 7" to 9", allow 10 points; 9" and above, allow 15 points	15
Habit	For Solandriflorum types the drooping habit is normal; but for Reginae and Leopoldi types, horizontal and slightly erect carriage are to be favored, although slight drooping is allowable.	5
Number of flowers to scape	For less than 3 or more than 5 allow 2 points; for 3 to 5 allow 5 points	5
Length of scape	The length should be considered in relation to size of flower; scapes too short or too long should be penalized	5
Character of scape	Scapes should not be so coarse as to be conspicuous, but should be sturdy enough to hold up flower well	3
Fragrance	Should not be too faint or too strong	2

* NOTE: No entry is to receive first prize unless a rating of a least 86 points is merited; second and third prizes may be awarded to entries rating from 76 points up. A separate Score Card for the Decorative Type will be adopted later.

Classes of Grandiflora and Miniature Varieties (Prize Schedule)

Color Classification (Fischer Color Chart)	Standard Grandiflora Varieties						Standard Miniature Varieties	
	Solandi- florum Type A	Solandi- florum Type B	Reginae Type A	Reginae Type B	Leopoldi Type A	Leopoldi Type B	Habran- thus Type	Phychella Type
White without markings.....	101	151	201	251	301	351	401	451
White with slight pale red markings.	102	152	202	252	302	352	402	452
White with lighter red markings....	103	153	203	253	303	353	403	453
White with lighter red stripes, keels, stars, tips, etc.	104	154	204	254	304	354	404	454
White with red stripe, keels, stars, tips, etc.	105	155	205	255	305	355	405	455
Yellow without markings	106	156	206	256	306	356	406	456
Yellow with markings	107	157	207	257	307	357	407	457
Bronze without markings	108	158	208	258	308	358	408	458
Bronze with slight markings.....	109	159	209	259	309	359	409	459
Bronze with distinct markings.....	110	160	210	260	310	360	410	460
Orange without markings.....	111	161	211	261	311	361	411	461
Orange with slight markings.....	112	162	212	262	312	362	412	462
Orange with distinct markings.....	113	163	213	263	313	363	413	463
Pale red without markings.....	114	164	214	264	314	364	414	464
Pale red with slight markings.....	115	165	215	265	315	365	415	465
Pale red with distinct markings	116	166	216	266	316	366	416	466
Lighter red to light red without markings	117	167	217	267	317	367	417	467
Lighter red to light red with slight markings	118	168	218	268	318	368	418	468
Lighter red to light red with distinct markings	119	169	219	269	319	369	419	469
Red without markings	120	170	220	270	320	370	420	470
Red with slight markings	121	171	221	271	321	371	421	471
Red with distinct markings.....	122	172	222	272	322	372	422	472
Dark red	123	173	223	273	323	373	423	473
Darker red	124	174	224	274	324	374	424	474
Violet red	125	175	225	275	325	375	425	475
Rainbow and tri-color types, exclud- ing green.....	126	176	226	276	326	376	426	476
Any other color.....	127	177	227	277	327	377	427	477
Best bloom of type.....	149	199	249	299	349	399	449	499

SECTION B. HEMEROCALLIDEAE

Class 501 Hemerocallideae

SECTION C. AMARYLLIDALES (except Genus Hippeastrum;
See Section A, above)

Class 551. Agapantheae	Class 951. Ixioliriae
Class 601. Allieae	Class 1001. Eucharideae
Class 651. Gilliesieae	Class 1051. Eustephieae
Class 701. Galantheae	Class 1101. Hippeastreae (Except Genus Hippeastrum; See Section A, above)
Class 751. Amaryllideae	Class 1151. Narcisseae
Class 801. Crineae	Class 1155. Polyanthus Narcissus (N. tazetta)
Class 851. Zephyrantheae	
Class 901. Haemantheae	

SECTION D. ALSTROMERIALES

Class 1201. Alstroemeriaceae	Class 1251. Petermanniaceae
Class 1301. Philesiaceae	

2. Description and Phylogeny

The Hemerocallideae, Alstroemeriales and Amaryllidales*

DR. J. HUTCHINSON, *Kew Gardens, England*

Order 89. LILIALES

* * * * *

293. LILIACEAE

* * * * *

Tribe 8. *HEMEROCALLIDEAE*.—Rootstock a *rhizome* or the latter *bulb-like*; leaves all *basal* or towards the base; flowers usually racemose or paniculate; perianth-segments *connate* into a funnel-shaped tube, erect or pendulous; corona absent; stamens hypogynous or on the tube; anthers dorsifixed, introrse; ovules numerous; fruit a loculicidal capsule.

Distribution.—Eastern Asia, N. America.

Further development, to *TULIPEAE* and *AMARYLLIDACEAE*.

A. Leaves petiolate; rhizome woody...*HOSTA* (*Funkia*) (China, Japan). AA. Leaves strap-shaped. B. Rootstock a rhizome; roots often thickened: C. Flowers in a panicle...*HEMEROCALLIS* (E. Asia). CC. Flowers from the axils of radical bracts ... *LEUCOCRINUM* (N. Amer.). BB. Rootstock bulb-like ... *HESPEROCALLIS* (Calif.).

* * * * *

Order 90. ALSTROEMERIALES

Rootstock a rhizome with *fibrous* or *tuberous roots*; stems *leafy*, *erect* or *climbing*; leaves alternate, linear to ovate; flowers showy, in a terminal cluster or raceme; perianth-segments 6, free or partly connate, equal or sometimes *one somewhat dissimilar*; stamens 6, free or partly connate; ovary *superior* or *usually inferior*; 3-celled with axile placentas, or 1-celled with parietal placentas; fruit a capsule or berry; seeds with copious endosperm.

Mainly Southern Hemisphere.

- A. Ovary inferior:
 - B. Fruit a capsule; inflorescence terminal, often surrounded by a whorl of leaves; stem herbaceous and erect or woody and climbing; Central and S. America
ALSTROEMERIACEAE
 - BB. Fruit a berry; inflorescence leaf-opposed; ovary 1-celled, with parietal placentas; woody climber with reticulately veined leaves; Australia
PETERMANNIACEAE
- AA. Ovary superior; fruit a berry; flowers axillary or terminal; herbaceous or woody, often climbing; Southern Hemisphere PHILESICEAE

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299. ALSTROEMERIACEAE¹

Rootstock a *rhizome* with fibrous roots sometimes bearing tubers; stems erect, ascending, or climbing, leafy. Leaves alternate, crowded or scattered, entire, the petiole usually twisted and reversing the surfaces. Flowers in a terminal cluster or irregular raceme, rarely solitary, showy, hermaphrodite, more or less actinomorphic but often one segment of the perianth different from the others and more spotted. Perianth-segments *free to the base*, inserted on an epigynous annulus, in two series, often narrowed to the base or spatulate. Stamens 6, inserted on an annulus at the base of the segments; filaments free; anthers introrse, oblong or ovoid, *basifixed*, opening lengthwise. Ovary *inferior*, 3-celled with axile placentas or 1-celled with parietal placentas; style filiform, shortly 3-lobed. Ovules numerous in each cell or on each placenta, anatropous. Fruit a *capsule*, more or less truncate, loculicidally 3-valved, crowned by the persistent epigynous annulus or by the persistent perianth-segments. Seeds numerous, with a small embryo in copious endosperm.—B.H. 3:735, tribe *Alstroemerieae* (in greater part); Rendle, 308.

Confined to Central and South America.

A. Ovary 3-celled, with axile placentas: B. Perianth-segments of the two series similar in size but often not in colour; roots not tuberous. ALSTROEMERIA (S. Amer.). BB. Perianth-segments dissimilar, the outer shorter than the inner; roots often tuberous. BOMAREA (Cent. and S. Amer.). AA. Ovary 1-celled, with parietal placentas: C. Inflorescence capitate, several flowered; perianth-segments spatulate, persistent and erect-patent in fruit. LEONTOCHIR (Chile). CC. Inflorescence 1-flowered. SCHICKENDANTZIA (Andes).

300. PETERMANNIACEAE

A tall *woody climber*; stem more or less *prickly*. Leaves alternate, shortly petiolate, lanceolate, acuminate, with numerous sub-parallel nerves and *reticulate veins*. Flowers hermaphrodite, in lax few-flowered cymes; cymes *lateral or leaf-opposed*, sometimes modified into a *branched tendril*. Perianth 6-partite; segments oblong, spreading or at length deflexed, subequal. Stamens 6, inserted at the base of the perianth; filaments erect; anthers oblong, extrorse, cells contiguous, the connective not produced. Ovary inferior, 1-celled *with 3 parietal placentas*; style slender, with a terminal capitate stigma; ovules numerous. Fruit a many-seeded *berry*.—B.H. 3:746 (under *Dioscoreaceae*).

Australia.

Genus PETERMANNIA; species 1.

Bentham and Hooker f. say of *Petermannia* in the Genera Plantarum (l.c.):² "genus habitu perianthio et staminibus potius Liliaceis (Smilaceis) quam Dioscoreaceis accedit, sed ovarium distincte inferum, et in utroque ordine insigne est placentis parietalibus multiovulatis".

301. PHILESIACEAE

Shrubs, undershrubs or tall climbers, sometimes semi-epiphytic from a slender branched rhizome. Leaves alternate, oblong to ovate, with prominent parallel nerves and reticulate or with prominent transverse veins between the nerves. Flowers terminal or axillary, pendulous, solitary, fasciculate or cymose-racemose, white, greenish or red, hermaphrodite, actinomorphic. Perianth at length deciduous; segments free or connivent or connate into an urceolate tube, subequal or the outer calyx-like and the inner petaloid; no corona. Stamens 6, hypogynous or at the base of the segments or on the perianth-tube; filaments free or partly connate into a tube; anthers dorsifixed in the middle or near the base, introrse or sublaterally introrse, opening by slits lengthwise. Ovary superior, 3- or 1-celled, with axile or parietal placentas; style 1, with a capitate or shortly 3-lobed stigma. Ovules numerous to few. Fruit a *berry*.—B.H. 3:766, as greater part of tribe *Luzuriageae*.

¹Dumort. Anal. Fam. Pl. 57, 58 (1829).

²"A genus with the habit, perianth, and stamens rather of Liliaceae (Smilaceae) than of Dioscoreaceae, but the ovary distinctly inferior, and remarkable in either family in having parietal multiovulate placentas."

Southern Hemisphere; New Guinea, Pacific Islands, New Caledonia, Australia, New Zealand, Temp. S. America, S.-E. Africa.

Philesiaceae is a very distinctive group of the *Liliales*, usually included in the family *Liliaceae* as a tribe or subfamily under the names *Luzuriageae* or *Luzuriagoidae* respectively. Although Lindley¹ knew only the genera *Philesia* and *Lapageria*, he considered the group to be worthy of family rank, a status maintained for it here, which it seems to require. The woody stems, reticulate-veined leaves, simple or slightly lobed style, and baccate fruit, coupled with the distinct geographical distribution, provide a combination of characters separating it from other families of the *Liliales*. The stems are woody and either climbing or suffrutescent and sometimes semi-epiphytic, often growing on old rotting tree-stumps in forests.

The family as constituted here is found only in the Southern Hemisphere, one monotypic genus, *Behnia* (*B. reticulata* Ditr.), being in South-Eastern Africa, from Uitenhage through the eastern provinces as far north as Gazaland. The link with this region and Australia is provided by *Elachanthera*, a monotypic genus which occurs at Nikol Bay, in North-Western Australia (20° 35' S., 116° 5' E.). The genus *Luzuriaga* connects very closely the floras of Subantarctic South America and New Zealand, *L. marginata* Benth. and Hook. f., and *L. parviflora* Kunth, occurring in these respective regions, having even been regarded as the same species.

A. Erect under shrubs: *B.* Perianth-segments subequal, spreading; habit of a *Phyllanthus*; ovary 3-celled. LUZURIAGA (Chile and N. Zeal). BB. Perianth-segments very unequal, erect, the inner much longer than the outer; leaves 1-nerved; ovary 1-celled, with parietal placentas. PHILESIA (Chile, Magell.). AA. Climbers: C. Perianth-segments free or nearly so: D. Perianth-segments erect, thick; leaves 3-5-nerved; ovary 1-celled, with parietal placentas. LAPAGERIA (Chile). DD. Perianth-segments spreading; ovary 3-celled: E. Inner perianth-segments fimbriate-ciliate. EUSTREPHUS (Austral.). EE. Inner perianth-segments not ciliate: F. Perianth-segments nerveless; anthers rounded-ovate. ELACHANTHERA (N.-W. Austral.). FF. Perianth-segments distinctly nerved; anthers oblong-linear. GEITONOPLESIMUM (Austral., N. Caled., Pacif. Isl.). CC. Perianth-segments united into a campanulate tube; transverse veins prominent; ovary 3-celled. BEHNIA (S.-E. Afr.).

* * * * *

Order 93. AMARYLLIDALES

Herbs with a tunicated bulb (very rarely a rhizome); leaves radical, usually linear; flowers mostly showy, umbellate or rarely solitary on a leafless stem (scape) and subtended by an involucre of 1 or more mostly thin bracts; stamens generally 6; corona present or absent; ovary superior or inferior, mostly 3-celled with axile placentas; fruit a capsule or berry.

Temperate and warm-temperate regions, rarer in the tropics.

One family AMARYLLIDACEAE

306. AMARYLLIDACEAE

Herbs with a tunicated bulbous rootstock or very rarely a rhizome. Leaves few from the base of the stem or bulb, more or less linear, with parallel nerves and transverse secondary nerves. Flowers usually showy, hermaphrodite, actinomorphic, solitary to many and umbellate at the top of the scape, subtended by an involucre of two or more (rarely only one) usually membranous bracts. Perianth inserted below or usually above the ovary, petaloid, often withering and persisting, with or without a tube; segments or lobes 6, in 2 series, all equal and similar or the inner smaller or larger than the outer; corona often present. Stamens 6 (rarely more), opposite the segments or lobes of the perianth, hypogynous or inserted on the tube or towards the base of the segments; filaments free or expanded at the base and connate and forming a "false" corona; anthers 2-celled, introrse, basi-fixed or versatile, opening by slits lengthwise. Ovary superior or inferior, 3-celled (or rarely by abortion 1-celled), with

¹Lindley, Veg. Kingd. 217 (1841).

axile (rarely parietal) placentas; style slender, with a capitate or 3-lobed stigma. Ovules mostly numerous in each cell and superposed in 2 series, anatropous. Fruit a capsule, or fleshy and indehiscent. Seeds usually numerous, with fleshy endosperm surrounding the small embryo, sometimes angular or compressed and winged.—B.H. 3:811, partly (as to tribe *Amaryllleae* only), and incl. greater part of tribe *Allieae* of *Liliaceae*; E.P. 2, 5:97 (1887); ed. 2, 15A:391 (partly); Baker, Handbook of the Amaryllidaceae (1888).

Temperate and warm-temperate regions, rarer in the tropics.

USEFUL PRODUCTS: Onion (*Allium Cepa* L.).

The old distinction between the *Liliaceae* and *Amaryllidaceae*—"stamens 6, ovary superior" in the one, "stamens 6, ovary inferior", in the other,—was too simple, and separated genera which are otherwise very closely related. I have, therefore, taken a somewhat drastic step in including in the *Amaryllidaceae* certain groups formerly placed in the *Liliaceae*. These are the African tribe *Agapantheae*, the South American tribe *Gilliesieae*, and the widely spread tribe *Allieae*. As stated in the preface to this book, I consider in this case the type of inflorescence, *umbellate*, with an *involucre of bracts*, to be of greater taxonomic importance, and giving a more natural grouping than the superior or inferior ovary, the only character formerly separating the families *Liliaceae* and *Amaryllidaceae*. Although it is admitted that in many groups of plants the character of the superior or inferior ovary may be of fundamental importance for distinguishing families, its value in the petaloid Monocotyledons has been much over-emphasised, and has led to artificial classification.

But I have excluded the tribes *Hypoxideae*, *Alstroemerieae*, *Agaveae*, and the *Vellozieae*, included in the family by Bentham and Hooker, and I can even less admit the *Conostyleae*, Bentham and Hooker's second tribe of the *Haemodoraceae*, transferred to the *Amaryllidaceae* by Pax in Engler's Pflanzenfamilien.

As here delimited *Amaryllidaceae* may have either a superior or an inferior ovary; they have nearly always 6 stamens, and the flowers are umbellate and subtended by an involucre of two or more bracts, or rarely the flowers are umbellate with a reduction to one bract or even one flower.

Except for the first and most primitive tribe, the *Agapantheae*, the rootstock is a corm or bulb; in *Agapantheae* it retains the rhizomatous character of the more primitive ancestral family *Liliaceae*, in which the rhizome has remained dominant. *Agapanthus*, a South African genus commonly grown in our gardens, is thus a link between the two families.

From these we pass to other two tribes which are more familiar to students in boreal countries, the *Allieae* and *Gilliesieae*. Here the bulb has become a fixed character. In *Allieae* there is no true corona; a "false" corona is sometimes present, for example in *Brevoortia*, in which there are only 3 fertile stamens, the others being petaloid and connate. In the tribe *Gilliesieae* there is a remarkable development of the androecium, which has become zygomorphic, whilst there is often a corona of scales quite apart from the six or more stamens. There is a decided orchidaceous look about the flowers of this tribe, especially of the genus *Gilliesia*, and it represents the most advanced type of flowers met with in those genera with a superior ovary.

The second half of the family, characterised by having an inferior ovary, may be divided primarily on the absence or presence of a corona. The more primitive types are without a corona, the *Galantheae*, *Amaryllideae*, *Crineae*, *Haemantheae*, *Ixoliriaeae*, and *Zephyrantheae*, the more advanced with a corona, the latter either "false" and formed by the united and often petaloid bases of the filaments, or a "true" corona separated from the filaments, formed either of separate teeth or scales or these united into an annulus or tube.

In both these divisions the most advanced tribes, the *Zephyrantheae*, in the group without a corona, and the *Narcisseae*, in the group with a corona, the umbel is often reduced to a solitary flower. There seems a close affinity between the tribe *Hemerocallideae*, in the *Liliaceae*, especially between the genus *Hosta* (*Funkia*), and tribe *Eucharideae* of the *Amaryllidaceae*, the latter tribe probably representing epigynous types of the former.

Key to the Tribes¹ of AMARYLLIDACEAE

A. Ovary superior: B. Rootstock a rhizome; corona absent or present...1. *AGAPANTHEAE*. BB. Rootstock a corm or bulb: C. Androecium actinomorphic; corona absent...2. *ALLIEAE*. CC. Androecium more or less zygomorphic, the filaments connate; corona usually present; mostly Chile...3. *GILLIESIEAE*. AA. Ovary inferior: D. Corona absent; no scales or teeth between the filaments; filaments not or rarely thickened at the base: E. Scape leafless except at the base: F. Ovules numerous: G. Perianth-tube absent or very short; stamens epigynous or inserted near the base of the segments: H. Perianth actinomorphic; flowers solitary or few together...4. *GALANTHEAE*. HH. Perianth more or less declinate or zygomorphic, flowers usually several in an umbel...5. *AMARYLLIDAE*. GG. Perianth-tube distinct; stamens inserted on the perianth-tube: I. Flowers several together, usually large and showy...6. *CRINEAE*. II. Flowers solitary or paired...7. *ZEPHRYANTHEAE*. FF. Ovules few...8. *HAEMANTHEAE*. EE. Scape leafy in the lower part; umbel subcompound...9. *IXOLIRIEAE*. DD. Corona present, either formed by the expanded petaloid filaments ("false corona") or of teeth, scales, or an annulus or tube: J. Corona "false", usually large and conspicuous, formed of the expanded filaments, the latter often connate at the base into a tube...10. *EUCHARIDAE*. JJ. Corona of separate teeth or scales between the filaments: K. Corona of small teeth; perianth-lobes not spreading...11. *EUSTEPHIEAE*. KK. Corona of scales; perianth-lobes spreading...12. *HIPPEASTREAE*. JJJ. Corona "true", of separate scales apart from the filaments, or annular or tubular and separate from the filaments...13. *NARCISSEAE*.

Tribe 1. *AGAPANTHEAE*.—Rootstock a *rhizome*; stem scapose; inflorescence an umbel, subtended by an involucre of 2 or more bracts; perianth-segments similar, united; corona present or absent; stamens 6, inserted on the perianth-tube; anthers dorsifixed; ovary superior; fruit a loculicidal capsule.

Distribution.—Tropical and S. Africa.

A. Perianth without a corona; stamens exserted...*AGAPANTHUS* (S. Afr.). AA. Perianth with an annular corona or the latter of entire or 2-fid free scales; stamens included in the tube...*TULBAGHIA* (Trop. and S. Afr.).

Tribe 2. *ALLIEAE*.—Rootstock a bulb or corm; stem scapose, leafless; leaves radical; inflorescence an umbel, subtended by an involucre of 2 or more bracts; perianth-segments similar, free or united; no corona; stamens 6 or 3; anthers dorsifixed; ovary superior; fruit a loculicidal capsule.

Distribution.—Almost all American, except *Allium*, widely spread in N. Hemisphere.

A. Perfect stamens 6: B. Perianth-segments free or united only below the middle: C. Rootstock a fibrous-coated corm: D. Filaments dilated at the base into scales surrounding the ovary...*BLOOMERIA* (Calif.). DD. Filaments only slightly thickened below the middle...*MUILLA* (Calif.-Mexico). CC. Rootstock a tunicated bulb: E. Perianth-segments free or united only at the very base; strongly odorous...*ALLIUM* (N. Hemisph.). EE. Perianth-segments distinctly united towards the base; not odorous...*NOTHOSCORDUM* (Amer.). BB. Perianth-segments united to above the middle: F. Stamens free from one another: G. Stamens included in the perianth-tube, 2-seriate: H. Perianth-tube free from the ovary: I. Perianth-tube cylindric...*TRISTAGMA* (Chile). II. Perianth-tube campanulate...*STEINMANNIA* (Chile). III. Perianth-tube funnel-shaped...*BRODIAEA* (Amer.). HH. Perianth-tube partly adnate to the ovary and ventricose...*DIPHALANGIUM* (Mex.). GG. Stamens shortly exserted...*MILLA* (Mex.). FF. Stamens united into a tube: J. Flowers mauve or blue...*ANDROSTEPHIUM* (N. Amer.). JJ. Flowers red: K. Filaments united only at the base...*BEHRIA* (Calif.). KK. Filaments united to the middle...*BESSERA* (Mex.). AA. Perfect stamens 3: L. Stamens included in the perianth-tube: M. Perianth-tube cylindric...*LEUCOCORYNE* (Chile). MM. Perianth-tube funnel-campanulate...

¹Descriptions only of those tribes now transferred for the first time to this family are given in the following enumeration.

BRODIAEA (Amer.). LL. Stamens exerted from the tube: O. Perianth-tube subglobose... STROPHOLIRION (Calif.). OO. Perianth-tube broadly cylindric... BREVOORTIA (Calif.).

Tribe 3. *GILLIESIEAE*.—Rootstock a tunicated bulb; leaves radical, linear; flowers in a terminal umbel; involucre of 2 bracts; perianth-segments subequal to unequal, free or united into a short tube; corona absent or present, of separate scales; stamens 6 or 13; filaments usually more or less connate, and often oblique; anthers dorsifixed, introrse; ovary superior, 3-celled; style entire or shortly lobed; fruit a loculicidal capsule.

Distribution.—Mostly Chile.

A. Corona absent: B. Filaments free from one another... ERINNA. BB. Filaments connate at the base: C. Perianth-segments 6; Perianth-segments united at the base... SOLARIA. Perianth-segments free to the base... SPEEA CC. Perianth-segments 3... TRICHLORA (Peru). AA. Corona present, of separate scales: D. Filaments 6: E. All 6 filaments bearing anthers... MIERSIA. EE. Three of the filaments without anthers: F. Perianth-segments unequal... GILLIESIA. FF. Perianth-segments subequal... GETHYUM. DD. Filaments 3, only 2 bearing anthers... ANCRUMIA.

Tribe 4. *GALANTHEAE*.—A. Perianth-segments unequal... GALANTHUS (Eur., W. Asia). AA. Perianth-segments equal or nearly so: B. Flowers erect: C. Anthers sagittate at the base... LAPIEDRA (S. Spain). CC. Anthers not sagittate at the base, dorsifixed: D. Scape 1-flowered... [STERNBERGIA]. DD. Scape several-flowered... [STRUMARIA]. BB. Flowers nodding; anthers not sagittate at the base... LEUCOIUM (Mediterr. Reg.).

Tribe 5. *AMARYLLIDEAE*.—A. Filaments free and not swollen at the base: B. Ovules closely sessile on or sunk in the placentas; perianth-tube curved... AMARYLLIS (S. Afr.). BB. Ovules more or less stalked on the placentas: C. Anthers attached in the middle... BRUNSVIGIA (S. Afr.). CC. Anthers attached at or towards the base; capsule 3-lobed... UNGERNIA (Persia). AA. Filaments swollen at the base and continued beyond the point of insertion down to the ovary; perianth-segments narrow... NERINE (S. Afr.).

Tribe 6. *CRINEAE*.—A. Anthers subbasifixed... CHLIDANTHUS (S. Amer.). AA. Anthers medianly dorsifixed: B. Ovules closely sessile or immersed in the placenta: C. Flowers subsessile or very shortly stalked... CRINUM (Trop. and Subtrop.). CC. Flowers long-stalked: D. Perianth straight... AMMOCHARIS (S. Afr.). DD. Perianth declinate; tube short... [AMARYLLIS] BB. Ovules not immersed in the placentas; seeds winged; flowers sessile or stalked: E. Flowers more or less curved; perianth-lobes not connected at the base by a callus: F. Perianth-limb much shorter than the tube... CYRTANTHUS (Trop. and S. Afr.). FF. Perianth-limb nearly as long as the tube... STENOLIRION (E. Afr.). EE. Flowers straight: G. Perianth-lobes connected at the base by a callus... VALLOTA (S. Afr.). GG. Perianth-lobes not connected at the base by a callus... UNGERNIA (Persia).

Tribe 7. *ZEPHYRANTHEAE*.—A. Perianth-segments broad, more or less elliptic or obovate: B. Perianth-tube short... ZEPHYRANTHES (Trop. and Subtrop. Amer.). BB. Perianth-tube elongated: C. Anthers basally dorsifixed... COOPERSIA (Mexico, Texas). CC. Anthers medianly dorsifixed: D. Filaments free, short: E. Scape very short... HAYLOCKIA (Extratrop. S. Amer.). EE. Scape long... ZEPHYRANTHES (Trop. and Subtrop. Amer.). DD. Filaments expanded and united into a tube in the lower part... CROCOPSIS (Peru). AA. Perianth-Segments more or less narrow: F. Stamens arranged in 2 series at different levels... APODOLIRION (S. Afr.). FF. Stamens in 1 series inserted at the same levels: G. Filaments filiform... STERNBERGIA (Cent. Eur., Mediterr.). GG. Filaments very short, not filiform... GETHYLLIS (S. Afr.).

Tribe 8. *HAEMANTHEAE*.—A. Anthers basifixed: B. Perianth-segments free to the base; flowers several or numerous in an umbel... HESSEA (S. Afr.). BB. Perianth-segments united into a fairly long tube; flowers few (1-5) in an umbel... CARPOLYZA (S. Afr.). AA. Anthers dorsifixed: C. Fruit a capsule: D. Ovules 6 or more in each cell;

style 3-angled or winged...STRUMARIA (S. Afr.). *DD.* Ovules 1-2; style not angular: *E.* Leaves sessile, linear...BUPHANE (Trop. and S. Afr.). *EE.* Leaves stalked...GRIFFINIA (Braz.). *CC.* Fruit a berry: *F.* Ovules 6 in each cell...CLIVIA (S. Afr.). *FF.* Ovules 2 in each cell...HAEMANTHUS (Demensea) (Trop. and S. Afr.). *FFF.* Ovule solitary in each cell...CHOANANTHUS (East Afr.).

Tribe 9. *IXIOLIRIEAE*.—One genus *IXIOLIRION* (Cent. and W. Asia).

Tribe 10. *EUCHARIDEAE*.—*A.* Leaves *narrow*, linear or oblong-linear or lanceolate: *B.* Ovary 3-celled: *C.* Ovules numerous: *D.* Seeds flat: *E.* Seeds not winged: *F.* Corona very inconspicuous...HYLINE (Braz.). *FF.* Corona very conspicuous...STENOMESSON (Trop. Amer.). *EE.* Seeds winged at one end...PAMIANTHE (Trop. S.-W. Amer.). *DD.* Seeds angular...PANCRACTIUM (Canaries to Eastern Tropics). *CC.* Ovules 2 in each cell: *G.* Perianth-tube very short...ELISENA (*Plagiolirion*). *GG.* Perianth-tube long: *H.* Staminal corona-cup rather large; free part of filaments short, incurved...ISMENE (S. Amer.). *HH.* Staminal corona-cup small; filaments long, not incurved...HYMENOCALLIS (Amer.). *BB.* Ovary 1-celled...CALOSTEMMA (Austral.). *AA.* Leaves broad or broadish and petiolate: *I.* Ovules superposed: *J.* Membranes of filaments not connate or only slightly so...CALLIPHURIA (S. Amer.). *JJ.* Membranes of filaments connate. *K.* Perianth-tube cylindric with an expanded throat...EUCHARIS (Andes). *KK.* Perianth-tube narrowly funnel-shaped...STRICKLANDIA (Andes). *II.* Ovules ascending from the base (middle)...EURYCLES (Malay Archip., N. Austral.). Imperfectly known genus...KLINGIA (Namaqual.).

Tribe 11. *EUSTEPHIEAE*.—*A.* Perianth-tube much longer than the lobes: *B.* Filaments not winged beyond the corona...URCEOLINA (Andes). *BB.* Filaments winged to beyond the apex...HIERONYMIELLA (Argent.) *AA.* Perianth-tube shorter than the lobes: *C.* Filaments winged beyond the middle: wings of filaments not united...EUSTEPHIA (Peru). Wings of filaments united upwards...EUSTEPHIOPSIS (Argentine). *CC.* Filaments not winged: *D.* Filaments declinate: *E.* Filaments not connate at the base...CALLIPSYCHE (Andes). *EE.* Filaments connate at the base...EUCROSIA (Andes). *DD.* Filaments straight...PHAEDRANASSA (Andes).

Tribe 12. *HIPPEASTREAE*.—*A.* Ovules numerous in each ovary-cell: *B.* Perianth at most more or less declinate; flowers usually several together: *C.* Corona-scales very conspicuous; flowers rather small...PLACEA (Chile). *CC.* Corona-scales very small; flowers large...HIPPEASTRUM (S. Amer.). *BB.* Perianth bilabiate, solitary...SPREKELIA (Mexico). *AA.* Ovules 2-3 in each cell; seeds angular: *D.* Stamens exceeding the perianth-segments...LYCORIS (E. and E. Cent. Asia). *DD.* Stamens shorter than the perianth-segments...VAGARIA (Syria).

Tribe 13. *NARCISSEAE*.—*A.* Corona divided into lobes or scales: *B.* Corona of 12 scales; fruit a berry...CRYPTOSTEPHANUS (W. Trop. Afr.). *BB.* Corona of 6 small scales; fruit a capsule...TAPEINANTHUS (Spain, N. Afr.). *AA.* Corona often trumpet-like, sometimes a mere rim; fruit a capsule...NARCISSUS (Eur., Mediterr., W. Asia).

A Check List of the Bulbous Amaryllidaceae Native to the United States¹

By C. V. MORTON, *U. S. National Museum*

The following check-list has been prepared at the request of the Secretary of the American Amaryllis Society, and is essentially a compilation of published data. It does not represent a critical estimate of the group, but is intended nevertheless to include all species that have been reported as native to the United States.

The plants of this family are exceptionally difficult of study from herbarium material only, particularly in the case of *Hymenocallis*, in which the species are based largely on slight differences in the shape and tothing of the corona. In this genus there is great diversity of opinion regarding the species, and it is quite likely that the number here recognized will be considerably reduced when more study has been given to the living plants. Such a reduction can scarcely be made from herbarium material. The ranges stated are those commonly ascribed.

I. COOPERIA Herbert

1. *Cooperia Drummondii* Herbert, Botanical Register, 22: pl. 1835. 1836.

SYNONYMY:

Cooperia chlorosolen Herbert, Botanical Register, 22: pl. 1835. 1836, in note.

Cooperia Drummondiana Herbert, Amaryllidaceae, 178. 1837.

Cooperia Drummondiana var. *chlorosolen* Herbert, Amaryllidaceae, 178. 1837.

Zephyranthes Herbertiana D. Dietrich, Synopsis Plantarum, 2: 1176. 1840.

Zephyranthes chlorosolen D. Dietrich, Synopsis Plantarum, 2: 1176. 1840.

RANGE: Southern Kansas, Oklahoma, and central Texas between the 95th and 100th meridians, southward to Tamaulipas, Nuevo Leon, and San Luis Potosi.

2. *Cooperia pedunculata* Herbert, Amaryllidaceae, 179, pl. 42, fig. 3-5. 1837.

SYNONYMY:

Sceptranthes Drummondii Graham, Edinburgh New Philosophical Journal, 40: 413. 1836.

Zephyranthes Drummondii D. Don in Sweet, British Flower Garden, Ser. II, pl. 328. 1836.

RANGE: South-central Texas, Coahuila, Tamaulipas, and Nuevo Leon.

II. CRINUM Linnaeus

1. *Crinum americanum* Linnaeus, Species Plantarum, 292. 1753.

RANGE: Florida and along the Gulf Coast to eastern Texas. Doubtfully recorded from Arkansas. West Indian records for this species are probably erroneous.

III. HYMENOCALLIS Salisbury

Hymenocallis was segregated in 1812 from the Linnaean genus *Pancratium* by Salisbury, chiefly on the basis of its few-seeded capsules. It is a fairly uniform genus, despite the adoption by some authors of several segregated genera such as *Ismene* and *Choretis*, and its validity has never been questioned.

1. *Hymenocallis bidentata* Small, Manual Southeastern Flora, 323. 1933.

RANGE: Alabama.

NOTE: See remark under *H. mexicana*.

2. *Hymenocallis Collieri* Small, Manual Southeastern Flora, 322. 1933.

RANGE: Florida.

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3. *Hymenocallis coronaria* (Le Conte) Kunth, Enumeratio, 5: 855. 1850.

SYNONYMY:

Pancratium coronarium Le Conte, Annals Lyceum New York, 3: 145, pl. 4, fig. 7-9. 1836.

Tomodon coronarium Rafinesque, Flora Telluriana 4: 22. 1838.

RANGE: Known only from the region of the Fall Line in Georgia and South Carolina. A photograph of a plant supposed to be of this species was published by R. M. Harper (Torreya, 14: 153. 1914), but the herbarium material collected at the same time does not seem to be *H. coronaria*, if any reliance is to be placed on the details of the structure of the corona.

4. *Hymenocallis crassifolia* Herbert, Appendix to Botanical Register, 44. 1821.

SYNONYMY:

Pancratium crassifolium Schultes, Systema Vegetabilium, 7, pt. 2: 921. 1830.

Hymenocallis crassiflora Herbert; Kunth, Enumeratio, 5: 677. 1850. (error).

RANGE: The identity of this species appears to be uncertain. The plant was originally collected "Ex portu St. Mary, Floridae Orientalis, lat. circit. 29." The town of St. Mary's is now situated in Camden County, Georgia. It would be most interesting to know if this plant still exists in that vicinity. It should have suberect, fleshy, obtuse leaves almost three feet long and two inches broad.

5. *Hymenocallis floridana* (Rafinesque) Morton, comb. nov.

SYNONYMY:

Pancratium rotatum Le Conte, Annals Lyceum New York, 3: 144. 1836; not Ker, 1806.

Tomodon floridanum Rafinesque, Flora Telluriana, 4: 22. 1838.²

Hymenocallis rotatum Le Conte; Small, Manual Southeastern Flora, 324. 1933; not Herbert, 1821.

RANGE: Eastern Florida; described from the region of Lake George, on the St. Johns River.

NOTE: It may be presumed that Le Conte believed himself to be redescribing *P. rotatum* Ker, even though no synonym is cited, rather than treating of a new species. Rafinesque realized that two species were involved and gave Le Conte's *P. rotatum* the new name *floridanum* under his artificially segregated genus *Tomodon*. A proper combination under *Hymenocallis* has never been made.

6. *Hymenocallis galvestonensis* (Herbert) Baker, Handbook Amaryllideae, 126. 1888.

SYNONYMY:

Choretis galvestonensis Herbert, Amaryllidaceae, 219, fig. 35. 1837.

RANGE: Texas and Mexico.

7. *Hymenocallis keyensis* Small, Manual Southeastern Flora, 322. 1933.

RANGE: Florida.

NOTE: This species may not be distinct from *H. caymanensis* Herbert of the Bahama Islands and Cuba.

8. *Hymenocallis Kimballiae* Small, Manual Southeastern Flora, 323. 1933.

RANGE: Florida.

9. *Hymenocallis laciniata* Small, Manual Southeastern Flora, 323. 1933.

RANGE: Florida.

10. *Hymenocallis mexicana* (Linnaeus) Herbert, Appendix to Botanical Register, 44. 1821.

SYNONYMY:

Pancratium mexicanum Linnaeus, Species Plantarum, 290. 1753.

Pancratium rotatum Ker, Botanical Magazine, 21: pl. 827. 1805.

²Although dated 1836 this part of the Flora Telluriana was not published until 1838, according to Barnhart (Torreya, 7: 177. 1907).

Pancratium disciforme De Candolle in Redouté, Les Liliacées, pl. 155. 1806.

Hymenocallis lacera Salisbury, Transactions Horticultural Society (London), 1: 338. 1812.

Hymenocallis paludosa Salisbury, loc. cit.

Hymenocallis rotata Herbert, Appendix to Botanical Register, 44. 1821.

Hymenocallis rotata var. *biflora* Schultes, Systema, 7, pt 2: 921. 1830.

Hymenocallis rotata var. *pluriflora* Schultes, loc. cit.

Hymenocallis rotata var. *disciformis* Herbert, Amaryllidaceae, 217. 1837.

Nemepioidon mexicanum Rafinesque, Flora Telluriana, 4: 22. 1838.

Tomodon rotatum Rafinesque, loc. cit.

Tomodon riparium Rafinesque, loc. cit.

Hymenocallis Dillenii M. J. Roemer, Synopsis, pt. 4 (Ensatae), 174. 1847.

Hymenocallis disciformis M. J. Roemer, op. cit. 173.

Hymenocallis lacera var. *minor* Chapman, Flora Southern United States, ed. III, 494. 1897.

RANGE: Northern Florida and Alabama to North Carolina.

NOTE: The Linnaean species *Pancratium mexicanum* was founded wholly on the plate and description of *Pancratium mexicanum*, *flore gemello candido* of Dillenius (Hortus Elthamensis, 2: 299, pl. 222. 1732). According to Druce (The Dillenian Herbarium, 176. 1907) there is no specimen extant. Dillenius described his plant upon material cultivated from bulbs said to have come from Mexico, but no Mexican plants have ever been found bearing any very close resemblance to the figure, which is a fair representation of the plant known as *Hymenocallis disciformis* or *H. lacera* var. *minor*. In Small's new Manual of the Southeastern Flora this species is the one called *H. crassifolia*. *H. bidentata* Small may not differ specifically. The true *H. crassifolia* Herbert is perhaps a different plant. The species called *H. rotatum* Le Conte by Small is *H. floridana*.

11. *Hymenocallis occidentalis* (Le Conte) Kunth, Enumeratio, 5: 856. 1850.

SYNONYMY:

Pancratium occidentale Le Conte, Annals Lyceum New York, 3: 146. 1836.

Tomodon pratense Rafinesque, Flora Telluriana, 4: 22. 1838.

RANGE: Arkansas, Illinois, Indiana, Kentucky, and Tennessee. The range of this species to the southward and eastward is yet to be determined accurately, but it presumably extends to the Gulf States and Florida.

12. *Hymenocallis Palmeri* S. Watson, Proceedings American Academy, 14: 301. 1879.

SYNONYMY:

Hymenocallis humilis S. Watson, Proceedings American Academy, 14: 301. 1879.

RANGE: Florida.

13. *Hymenocallis tridentata* Small, Manual Southeastern Flora, 323. 1933.

RANGE: Florida.

DOUBTFUL AND EXCLUDED SPECIES.

HYMENOCALLIS CARIBAEA (Linnaeus) Herbert, Appendix to Botanical Register, 44. 1821.

SYNONYMY:

Pancratium caribaeum Linnaeus, Species Plantarum, 291. 1753.

NOTE: Although long thought to be native to southern Florida, this species is now considered by Urban and others to be endemic in the Lesser Antilles. The plants which formerly would have been referred to this species are now included in *Hymenocallis keyensis*, *H. Collieri*, and *H. Kimballiae*.

HYMENOCALLIS CAYMANENSIS Herbert, Amaryllidaceae, 614. 1837.

NOTE: Native of the Bahama Islands and Cuba. It has been reported from the Key Region of southern Florida,³ but is now excluded in Small's new Manual of the Southeastern Flora. *Hymenocallis keyensis* Small is perhaps not different.

³Small Flora Southeastern United States 291. 1903; Small, Flora of Miami, 45. 1913; Small, Flora of Florida Keys, 34. 1913.

HYMENOCALLIS VIRIDIFLORA Small, Manual Southeastern Flora, 322. 1933 (name only).

NOTE: This name appears as No. 10 in the key, probably as the result of a clerical error. The name under which species no. 10 is described by Small is *Hymenocallis rotatum* Le Conte.

ISMENE KNIGHTII Knowles & Wescott, Floral Cabinet, 2: pl. 59. 1838.

NOTE: The original plate and description show a species of *Hymenocallis* bearing 10- to 12-flowered scapes. The corolla tube is greenish and scarcely longer than the pure white segments. The corona is strictly rotate-spreading, orbicular in outline, and dentate-erose between the filaments. This species was founded on material collected by Henry Knight in March, 1836, in a swamp within a mile of the city of Mobile, Alabama, and should be searched for by residents of that district.

PANCRATIUM CAROLINIANUM Linnaeus, Species Plantarum, 291. 1753.

SYNONYMY:

HYMENOCALLIS CAROLINIANA Herbert, Appendix to Botanical Register, 44. 1821.

NOTE: This species was founded on the *Lilio narcissus polyanthos, flore albo*, of Catesby (Natural History of Carolina, 2, pt. 3: pl. 5. 1733). This plate obviously represents *Pancratium maritimum* Linnaeus, a native of the Mediterranean region, and must have been drawn from a cultivated plant.

PANCRATIUM LIRIOSME Rafinesque, Florula Ludoviciana, 19. 1817.

NOTE: Although described from Louisiana this species seems to be the same as *Pancratium maritimum* Linnaeus, of Europe, and was probably based on cultivated material.

PANCRATIUM NUTANS Ker, Quarterly Journal Science and Arts, 3: 324. 1817.

SYNONYMY:

Ismene nutans Herbert, Appendix to Botanical Register, 46. 1821.

NOTE: This tropical species has been erroneously supposed to have come from South Carolina and was so listed by Chapman in the first and second editions of his Flora of the Southern United States.

IV. ZEPHYRANTHES Herbert

The generic name *Atamosco* Adanson is applied to this genus by some American authors but is perhaps best disregarded as being inadequately published (*nomen subnudum*).

1. *Zephyranthes atamasca* (Linnaeus) Herbert, Appendix to Botanical Register, 36. 1821.

SYNONYMY:

Amaryllis atamasca Linnaeus, Species Plantarum, 292. 1753.

Atamosco atamasco Greene, Pittonia, 3: 187. 1897.

RANGE: Virginia to Florida, Alabama, and Mississippi.

NOTE: The specific name is frequently spelled *atamasco*, but the original spelling of Linnaeus is *atamasca*.

2. *Zephyranthes chrysantha* Greenman & Thompson, Annals Missouri Botanical Garden, 1: 406. 1915.

RANGE: Known only from the type collection, from Rio Hondo, Cameron County, Texas.

3. *Zephyranthes erubescens* S. Watson, Proceedings American Academy, 25: 162. 1890.

RANGE: Described from cultivated plants perhaps originally from Duval County, Texas.

4. *Zephyranthes longifolia* Hemsley, Diagnoses Plantarum Novarum, 55. 1880.

SYNONYMY:

Zephyranthes aurea S. Watson, Proceedings American Academy, 18: 161. 1883.

Atamosco longifolia Cockerell, Canadian Entomologist, 33: 283. 1901.

RANGE: Western Texas, New Mexico, and southern Arizona, southward into Mexico.

5. *Zephyranthes pulchella* J. G. Smith, Annual Report Missouri Botanical Garden, 6: 114. 1895.
SYNONYMY:
Atamosco pulchella Greene, Pittonia, 3: 187. 1897.
RANGE: Southern Texas.
6. *Zephyranthes Simpsoni* Chapman, Flora Southern United States, Ed. II. Suppl. 2, 696. 1892.
SYNONYMY:
Atamosco Simpsoni Greene, Pittonia, 3: 187. 1897.
RANGE: Florida.
7. *Zephyranthes texana* Herbert, Botanical Magazine, 63: pl. 3482. 1836, in note.
SYNONYMY:
Habranthus Andersonii var. *texanus* Herbert, Botanical Magazine, 64: pl. 3596. 1837.
Habranthus texanus Herbert, ex Steudel, Nomenclator, ed. II, 1: 717. 1840.
Atamosco texana Greene, Pittonia, 3: 187. 1897.
RANGE: Central and southern Texas.
8. *Zephyranthes Treatiae* S. Watson, Proceedings American Academy, 14: 300. 1879.
SYNONYMY:
Atamosco Treatiae Greene, Pittonia, 3: 187. 1879.
RANGE: Florida.

Catalog of Argentine Amaryllidaceae

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Argentine Ministry of Agriculture, Buenos Aires

AGAVE L.

- A. americana* L. Distr. geogr: Tucuman, Cordoba, Buenos Aires.

ALSTROEMERIA L.

- A. aurantiaca* Don. Distr. geogr: Nahuel-Huapi.
A. Bakeri Pax. Catamarca.
A. Diazii Phil. Nahuel-Huapi, Chubut.
A. inodora Herb. Misiones.
A. lightu L. Nahuel-Huapi.
— var. *pulchra* Sims. Patagonia.
A. nana Rendle. Lago Argentino.
A. patagonica Phil. Tierra del Fuego, Santa Cruz, Chubut.
A. pelegrina L. Buenos Aires.
A. rosea Phil. Mendoza.
A. spathulata Presl. Mendoza.

BOMAREA Mirb.

- B. edulis* (Juss.) Herb. Distr. geogr: Misiones.
B. macrocephala Pax. Tucuman.
B. purpurea (Ruiz et Pav.) Herb. Tucuman.
B. rosea (Ruiz et Pav.) Herb. Tucuman.
B. stricta Pax. Misiones.

CHLIDANTHUS Herb.

- C. fragrans* Herb. Distr. geogr: Buenos Aires, Mendoza, Tucuman.

CRINUM L.

- C. argentinum* Pax. Distr. geogr: Tucuman.

EUSTEPHIA Cav.

- E. argentina* Pax. Distr. geogr: Catamarca.
E. Coccinea Cav. Tucuman.
E. marginata Pax. La Rioja.

EUSTEPHIOPSIS R. E. Fries.

- E. latifolia* R. E. Fries. Distr. geogr: Jujuy.
E. speciosa R. E. Fries. Jujuy.

HAYLOCKIA Herb.

- H. andina* R. E. Fries. Distr. geogr: Jujuy.
H. pusilla Herb. Buenos Aires.
— var. *rubella* Herb. Buenos Aires.

HIERONYMIELLA Pax.

- H. chlidanthoides* Pax. Distr. geogr: Catamarca.

HIPPEASTRUM Herb.

- H. ambiguum* Herb. Distr. geogr: Buenos Aires, Jujuy. Misiones.
H. ambiguum Herb., var. *Tweedianum* Herb. Misiones, Jujuy.
H. angustifolium Pax. Misiones.
H. Bagnoldi (Herb.) Baker. Patagonia, Chubut.
 — var. *minor* Speg. Nahuel-Huapi.
H. bicolor (Ruiz et Pav.) Baker. Mendoza.
H. bifidum (Herb.) Baker. Buenos Aires, Misiones.
H. bonariense OK. Buenos Aires.
H. brachyandrum Baker. Corrientes.
H. breviflorum Herb. Buenos Aires.
H. chilense (L'Herit.) Baker. Patagonia.
H. flammigerum Holmberg. Misiones.
H. gladioloides (Hieron.) Pax. San Juan.
H. Holmbergii Hicken. Misiones.
H. Jamesoni Baker. San Juan.
H. marginatum R. E. Fries. Jujuy.
H. pallidum (Herb.) Pax. Rio Negro a Mendoza y Catamarca.
H. petiolatum Pax. Corrientes, Misiones.
H. pratense (Herb.) Baker. Mendoza.
H. rutilum (Gawl.) Herb. Buenos Aires, Misiones.
H. tubispathum Pax. Misiones.
 — var. *grandiflora* Hicken. Misiones.
H. tucumanum Holmberg. Tucuman, Salta.

HYMENOCALLIS Salisb.

- H. calathina* (Herb.) Nichols. Distr. geogr: Buenos Aires.
H. littoralis (Jacq.) Salisb., var. *ditischa* Herb. Buenos Aires.
H. Niederleinii Pax. Misiones.

HYPOXIS L.

- H. decumbens* L. Distr. geogr: Buenos Aires, Entre Rios, Santa Fe, Tucuman.
 — var. *major* Holmberg. Tucuman.

SCHICKENDANTZIA Pax.

- Schickendantzia pygmaea* (Herb.) Speg. Distr. geogr: Catamarca, Tucuman, Salta, Jujuy.

ZEPHYRANTHES Herb.

- Z. Andersonii* (Herb.) Benth. et Hook. Distr. geogr: Patagonia, Prov. de Buenos Aires, Entre Rios.
 — var. *rosea* Holmberg. Tandil.
Z. andicola (Herb.) Baker. Mendoza, Cordillera de Villarica.

- Z. candida* (Lindl.) Herb. Buenos Aires, Entre Rios.
Z. carinata (Spreng.) Herb. Entre Rios.
Z. caerulea (Gris.) Baker. Entre Rios.
Z. Commersoniana Herb. Entre Rios, Misiones.
Z. entrerrian (O. Hoffman) Pax. Entre Rios.
Z. filifolia Herb. Patagonia
Z. flammea (Herb.) Baker. Mendoza.
Z. gracilifolia (Herb.) Baker. Buenos Aires, Entre Rios.
 — var. *bulula* Holmberg. Tandil.
 — var. *bijou* Holmberg. Prov. Buenos Aires.
Z. Hieronymi Pax. Entre Rios.
Z. jujuyensis Holmberg Jujuy.
 — var. *volcanica* Holmberg. Jujuy.
Z. longistyla Pax. Cordoba.
Z. mendocensis Baker. Mendoza.
Z. mesocloa Lindl. Del Rio Negro a Tucuman, Jujuy, Misiones.
Z. minima Herb. Buenos Aires, Entre Rios, Cordoba.
Z. porphyrospila Holmberg. San Luis.
Z. robusta (Herb.) Baker. Buenos Aires.
Z. timida Holmberg. Misiones.
Z. versicolor (Herb.) Baker. Buenos Aires.

ADDENDUM

- Alstroemeria apertiflora* Bak. Formosa.
Alstroemeria isabellana Herb. Corrientes.
Alstroemeria insignis Kranzl. Misiones.
Bomarea multiflora Mirb. Jujuy.
Bomarea spectabilis Schenk. Misiones.
Curculigo scorzoneraefolia (Lam.) Bak. Formosa.
Hippeastrum Bagnoldi (Herb.) Bak., var. *Gilliesianus* (Herb.) Mendoza.
Hypoxis catamarcensis Brack. Catamarca.
Hypoxis decumbens L., var. *major* Seub. Misiones.
Hypoxis humilis H. B. K. Cordoba.

NUMERICAL SUMMARY

Totals,—15 genera and 79 species.

INDIGENOUS AMARYLLIDS CULTIVATED IN THE REPUBLIC

- Hippeastrum ambiguum* Herb. Cultivated in Jujuy.
Hippeastrum rutilum (Garol.) Herb. Cultivated in Buenos y Rosario.
Alstroemeria aurantica Don. Cultivated in gardens.
Zephyranthes candida (Lindl.) Herb. Cultivated in homes and gardens.

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Phylogeny of the Amaryllidaceae

With the appearance of Dr. Hutchinson's phylogenetic arrangement of the *Amaryllidaceae*¹ it is in order to refer briefly to the foremost system which preceded it, the classification of Pax and Hoffman.²

Following Lindley (1836),³ Pax and Hoffman separate the *Amaryllidaceae* from *Liliaceae* on the basis of an inferior ovary in the former as contrasted with a superior ovary in the latter. The only exceptions noted are the *Conostylideae* and *Conothereae* where some species have superior ovaries.

The family, in which 86 Genera are recognized, is subdivided into four subfamilies, I. *Amaryllidoideae*, II. *Agavoideae*, III. *Hypoxidoideae*, and IV. *Campynematoideae*.

Subfamily I. *Amaryllidoideae*, is again divided into tribes and subtribes, under which 55 genera are arranged. The subtribe, *Amaryllideae*, comprises the *Heamanthinae*, *Galanthinae*, *Amaryllidinae*, *Zephyranthinae*, *Crinae*, and *Ixoliriinae*, and under the tribe *Narcisseae*, appear the subtribes *Dentiferae*, *Eucharidinae*, *Phaedranassinae*, *Hippeastrinae*, and *Narcissinae*.

Under Subfamily II. *Agavoideae*, are grouped seven genera.

Subfamily III. *Hypoxidoideae*, is divided into the tribes (*Alstroemerieae*, *Hypoxidoideae*, *Conothereae* and *Conostylideae*), under which 22 genera are grouped.

Subfamily IV. *Campynematoideae* comprises two genera.

Pax and Hoffman point out that in their opinion the *Amaryllidaceae*, according to their arrangement, is not monophyletic. The *Amaryllidoideae* are closely related to the *Liliaceae*, the *Agavoideae* suggest relationship to the *Dracaenoideae* under the *Liliaceae*, and the *Hypoxidoideae* to the *Haemodoraceae*.

Dr. Hutchinson has had the courage to strike out boldly and remove some of the cobwebs that have befuddled this subject for over a century. He notes that the separation of the *Amaryllidaceae* on the basis of the position of the ovary leads to an artificial system. With keen vision he notes that the important characters of the *Amaryllidaceae* are the umbelliferous flowering habit and the presence of an involucre of bracts. On this basis the *Amaryllidaceae* becomes a smaller and more homogeneous group embracing only subfamily I of Pax and Hoffman to which are added three groups characterized by superior ovaries, the *Agapantheae*, *Allieae* and *Gillieseae*.

According to Dr. Hutchinson the *Amaryllidaceae* have sprung from the *Liliaceae*, and he notes especially close relationship between certain members of the *Eucharideae* and the Genus *Hosta* of the *Hemerocallideae*, some of the former being considered as apparently epigynous types of the latter.

The *Agavoideae*, *Hypoxidoideae* and *Campynematoideae* of Pax and Hoffman are removed from the *Amaryllidaceae*. It is of interest to note that the *Alstroemerieae*, considered as a part of the *Hypoxidoideae* by Pax and Hoffman, are given the rank of a family closely allied to the *Liliaceae* in Dr. Hutchinson's arrangement.

Mira Flores,
Orlando, Florida.

HAMILTON P. TRAUB.

¹ J. Hutchinson "Amaryllidaceae" in "The Families of Flowering Plants. Vol. II. Monocotyledons", Macmillan. London. 1934.

² F. Pax and K. Hoffman. "Amaryllidaceae" in Engler and Prantl, "Die Natuerlichen Pflanzenfamilien" Vol. .. 19.., pp. 391-430.

³ John Lindley. "Amaryllidaceae" in "A Natural System of Botany, 2nd Ed." 1836.

Holmberg's "Amaryllidaceas Argentinas"

Through the kindness of Sr. José F. Molfino of the Argentine Ministry of Agriculture, we have received a copy of a valuable monograph on the *Amaryllidaceae* of the Argentine¹ by the venerable Dr. Holmberg, the Dean of the Argentine botanical fraternity.

The first part of the work is concerned with brief notes on such subjects as the distinguishing characters of the *Amaryllidaceae*, their habitat, and geographical distribution. Following this he arranges the indigenous and cultivated *Amaryllidaceae* according to the system of Pax and Hoffman. Dr. Holmberg describes quite a number of native Argentine species,—*Zephyranthes*, 18; *Haylockia*, 1; *Hippeastrum*, 21; *Hieronimiella*, 1; *Eustephia*, 3; *Alstroemeria*, 7; *Bomarea*, 5; *Schickendanzia*, 1; and *Hypoxis*, 1.

One of the most outstanding features of the monograph appears at the end giving the geographical distribution of the indigenous Argentine amaryllids. The data is presented in a table and an outline map.

We are indeed grateful to Dr. Holmberg for the excellent presentation of the subject.

HAMILTON P. TRAUB.

Mira Flores,
Orlando, Florida.

Distinguishing Characters of Florida *Zephyranthes*

H. HAROLD HUME,

University of Florida, Gainesville

According to Chapman (1) and Small (2), the genus *Zephyranthes* in Florida is represented by three species. Their chronology begins with *Z. Atamasco*, first mentioned in literature by Parkinson in 1629, named *Amaryllis atamusco* by Linneaus in 1753, and transferred to a new genus, *Zephyranthes*, by Herbert in 1821. The first specimens to find their way to Europe came from Virginia. This species was followed by *Z. Treatiae*, described by Sereno Watson in 1879. It was discovered in the vicinity of Green Cove Springs, Florida, by Mrs. Mary Treat, a naturalist from Vineland, New Jersey, who spent the winters of 1876-77-78 in Florida. *Z. Simpsonii*, the last of the three to be named and described, was found in the vicinity of Bradenton, Florida, by J. H. Simpson, botanist and plant collector, and sent by him to Dr. A. W. Chapman who added it, in 1892, as a new species to the list of known Florida plants.

The three species are closely related and present certain characters in common although differing in other particulars. Because of this the amateur and sometimes the professional botanist finds difficulty in separating them from one another and this is particularly true of herbarium specimens when poorly prepared or lacking certain parts. In the field, however, there is no real difficulty in separating them and determining which species is at hand. There are differences in habitat, growth habit, foliage and flowers that are characteristic.

HABITAT—*Z. Atamasco* is an inhabitant of swamps, river bottoms, subject to overflow, and the slopes of moist woodlands where vegetable matter and humus from tree debris are abundant. In the areas where it grows the tree population consists mainly of black gum, sweet gum, swamp chestnut oak, water oak, ash, cypress, red maple and wax myrtle. Both *Z. Treatiae* and *Z. Simpsonii* are flatwoods plants where they are found with pines, saw palmetto, gallberry and wax myrtle. To this statement two exceptions in the case of *Z. Treatiae* have been noted. In Hernando

¹ Eduardo Ladislao Holmberg. "Amaryllidaceas Argentinas; indigenas y exóticas cultivadas. Anales del Museo Nacional de Buenos Aires. Tomo XII: 75-192. 1905.

County, about Brooksville, this species is found in high hammocks where the growth consists of such trees as live oak, magnolia, iron wood, sweet gum, and red cedar and again near Magnesia Springs, in Alachua County, where it grows along a stream in low hammock. Aside from these exceptions *Z. Treatiae* has been collected by the writer only at stations where pine trees were close at hand.

GROWTH HABIT—*Z. Atamasco* forms offsets abundantly while *Z. Treatiae* and *Z. Simpsonii* do so to a very limited extent only. As a consequence there is a distinct difference in growth habit. The first named commonly is found growing in bunches, and as many as forty-six bulbs have been taken from a single clump. Leaves appear before the flowers and the plants stand out as green masses against the surrounding fallen leaves and dead vegetation. On the other hand, *Z. Treatiae* and *Z. Simpsonii* are found growing singly, scattered here and there over the ground.

FOLIAGE—The color and general appearance of the leaves serve to separate *Z. Atamasco* readily from the other two. Its leaves are bright shining green, thin along the edges and channeled on the upper surface. Those of *Z. Treatiae* and *Z. Simpsonii* are dull gray green, with thickened edges, and commonly much narrower than the leaves of *Z. Atamasco*. Once these differences are learned there is no difficulty in separating *Z. Atamasco* from the others when in growth. It is an interesting observation that the foliage of *Z. Atamasco* is nearly always much more abundant on herbarium specimens than is the case with either of the other two, due in part, at least, to the latter having lost their leaves by fire.

FLOWERS—A careful examination of the fresh flowers of the three species shows noteworthy differences. The sepals and petals of *Z. Treatiae* are strongly curved outward and downward; those of *Z. Atamasco* are commonly curved outward at an angle of about 45° or occasionally almost horizontal, and those of *Z. Simpsonii* are upright, slightly bent outward at the tips or not at all. The flower presents the appearance of a trumpet. In color there is little difference, but the sepals of *Z. Simpsonii* are washed or marked with pink more strongly than those of the other two. Furthermore, *Z. Simpsonii* is readily separated from the others by the relative position of the stigmas and stamens. The style is of such length as to bring them all together in the same plane. *Z. Simpsonii* is a polymorphic species, but the relative length of the stamens and style is always a very constant feature. In flowers of *Z. Atamasco* and *Z. Treatiae*, the style is of such length as to bring the stigmas well above the anthers, often as much as three-eighths or even half an inch.

SEASON—*Z. Atamasco* has been found in flower in Florida as early as December. Its main season is during February and March. *Z. Simpsonii* blooms during the season January through March, and has been collected as late as April. *Z. Treatiae* is most abundantly in bloom during March, though found as early as December and as late as June. Both *Z. Simpsonii* and *Z. Treatiae* are more commonly affected by variations in moisture than *Z. Atamasco*. Since the latter grows in wet and swampy soil its water supply is usually quite constant and in consequence it is more regular in its time of flowering.

DISTRIBUTION—Plant surveys in Florida are far from complete and therefore it is not possible to state with accuracy the distribution of native Zephyranthes. Many more collections must be made before all stations for these plants are located. *Z. Atamasco* is known to occur in four northeastern counties, Nassau, Duval, St. Johns and Clay, and two western counties, Gadsden and Jackson. The northernmost limit for *Z. Treatiae* is the southern edge of Charleton County, Georgia, and its range extends at least as far south as northwestern Highlands, southern Hillsborough and northwestern Polk Counties. It has not been collected west of the Apalachicola River. *Z. Simpsonii* belongs to peninsular Florida. So far as now known it does not occur north of a line drawn from central Flagler County through Gainesville to Cedar Key. From that line it extends southward to Lee County on the Gulf of Mexico and into Martin on the Atlantic Ocean. Collections of the three species substantiated by herbarium specimens have been made thus far in forty-five counties.

The Occurrence of Alkaloids in the Amaryllidaceae

ROBERT F. RUTHRUFF, *Indiana*

It is difficult to arrive at an entirely satisfactory definition of the term alkaloid, but for present purposes it is sufficient to state that alkaloids are basic nitrogen containing substances of vegetable origin exhibiting marked physiological action. The occurrence of such substances in various species of the Amaryllis Family is naturally of interest to members of this Society but their presence is of even broader significance since alkaloids, as a rule, occur only in dicotyledonous plants. It was known that bulbs of certain Amaryllaceae were poisonous long before they were subjected to chemical investigation. During the past 55 years considerable attention has been given to the problem and it is now definitely established that alkaloids are present in many species.

In 1878, Ringer and Morshead ¹* examined the alkaloids isolated by Gerrard from *Narcissus pseudonarcissus*. On the basis of experiments with men and frogs as subjects, these investigators concluded that dormant bulbs contained a substance similar to pilocarpine while an atropine like compound was present in flowering bulbs. Chemically the two extracts were identical and Ringer and Morshead applied the name "narcissa" to both materials indiscriminately. Fragner ² obtained a substance which he christened amarylline from *Sprekelia formosissima* and belamarine from *Amaryllis belladonna*. *Lycoris radiata* was investigated by Morishima, ³ who isolated two alkaloids which he named lycorine and sekesanine. The former was found to have a strong emetic action followed by paralysis.

Ewins ⁴ repeated the work of Ringer and Morshead and obtained the same alkaloid from both resting and flowering bulbs, although the concentration was only half as great in flowering bulbs. He observed that the alkaloid was not similar to either pilocarpine or atropine but had a marked emetic action instead. Ewins modernized the name suggested by Ringer and Morshead, designating the alkaloid narcissine. Only traces of this substance were found in *Narcissus princeps*.

Tutin ⁵ investigated bulbs of the extremely interesting *Buphane disticha* of South Africa, the "gift bol" (poison bulb) of the Dutch. Extracts from the bulb are reputedly employed as arrow poison and in medicine. ⁶ Previous investigators had stated that the bulb contained brucine which others had denied. Oliver ⁷ stated that the species contained aconitine. Tutin found neither of these alkaloids but isolated a base resembling hyoscyamine and hyoscyamine, which he called buphanine. Three other alkaloids were found, one being identical with narcissine. In addition to these alkaloids, Tutin also succeeded in identifying a number of other classes of organic compounds in extracts from this species. The bulb of *Buphane disticha* is similar to that of *Amaryllis belladonna* in that the outer layers are fibrous and of a fine silky texture, being used by the natives as surgical dressings. These portions contain no alkaloids, the active principles being concentrated in the inner portions of the bulbs, which also contain considerable copper.

Botanists are ever sailing between the Scylla of minute division of species and the Charybdis of gross grouping. To a lesser extent the chemist is beset by similar evils. Up to 1910-1920 each investigator believed that each Amaryllis alkaloid he isolated was new and distinct and so gave it an individual name. Now we enter an era in which attempts were made to show that the various alkaloids were identical, following which a second period of division begins. Asahina and Sugii ⁸ repeated the work of Morishima on *Lycoris radiata* and established the identity of lycorine with narcissine. Gorter ⁹ went even further, not only confirming the identity of lycorine and narcissine, but also stating that buphanine and the alkaloid from *Narcissus tazetta* isolated by Yumanouchi ¹⁰ were identical with the first two. Unaware of the early article of Ringer and Morshead and even that of Fragner, he suggested that the name lycorine be applied to all of them. Later Gorter ¹¹ discovered the Fragner reference and believed that the belamarine and amarylline therein described were identical and were also lycorine, as was the alkaloid isolated by Molls ¹² from *Clivia miniata*.

* Reference is made by number (italic) to Literature Cited at end of article.

Gorter found lycorine (which on grounds of priority should probably be designated narcissine even though Ringer and Morshead did not accurately characterize the compound) in *Zephyranthes rosea*, *Crinum asiaticum*, *C. giganteum*, *C. pratense*, *Hymenocallis littoralis*, *Eucharis grandiflora*, *Eurycles sylvestris*, *Amaryllis belladonna*, *Clivia Miniata*, *Cooperia drummondii*, *Cyrtanthus pallidus* and *Sprekelia formosissima*. *Crinum* species were found to contain the most alkaloid, representing 0.10 to 0.18% of the bulb. Gorter¹³ confirmed Ewins' formula, $C_{16}H_{17}O_4N$, for the compound, and in addition suggested a possible structural formula.

Kondo and Tomimura¹⁴ have recently done considerable work on *Lycoris radiata*, claiming to have isolated no less than nine separate and distinct alkaloids, including lycorine. It is evident that we are again entering an era of minute division, especially in view of the fact that Kolle and Gloppe¹⁵ have recently isolated a new alkaloid, narpoetine, from *Narcissus poeticus*.

The study of the toxic compounds in bulbs of the Amaryllis Family is of economic as well as scientific interest as the bulbs are eaten by man in time of famine and by cattle. Narita,¹⁶ in describing human foodstuffs used in time of famine, states that while amaryllis bulbs contain 15 to 20% sugar, the alkaloids present cause nausea. Steyer¹⁷ has found that bulbs of *Haemanthus amarylloides*, *Narcissus jonquilla* and *Nerine lucida* as well as the seeds of *Amaryllis belladonna* are definitely toxic to cattle.

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New Varieties

On account of lack of space the introducers' numbers and names, only, for the varieties are given in this issue for new varieties registered with the Secretary of the Society. This information is published to avoid duplication in names. Short descriptions will be published later. Names should be as short as possible, one word is sufficient. It is suggested that in no case should more than two words be used.

Hybrid Hippeastrum

Introduced 1934 and 1935 by Mrs. W. G. Tilghman, Palatka, Fla. Seedlings,—No. 1, *Elizabeth Traub*; No. 2, *Helen Tilghman*; No. 3, *Palatka*; No. 4, *Osceola*; No. 5, *Florida*; No. 6, *Helen Jane*.

Introduced 1934 and 1935 by Heaton Bulb & Palm Co., Mr. I. W. Heaton, Orlando, Florida. Seedlings,—No. 5233, *Orange King*; No. 5242, *Orlando*; No. 1, *War*; No. 29, *Marie*; No. 30, *Dawn*; No. 174, *Eola*; No. 177, *President Roosevelt*; No. 18, *E. P. Hall*; No. 19, *Peace*; No. 5001, *Orchid*; No. 5111, *Dr. Traub*; No. 901, *Red Wing*; No. 1500, *Mrs. Lamberton*; No. 5051, *Virginia*; No. 639, *Serapis II*; No. 971, *Mother*; No. 5033, *Mrs. Donald Dudley*; No. 5381, *Faith*; No. 5387, *Helen*; No. 5036, *Henry Nehrling*; No. 5173, *Sunset*; No. 5058, *Ralph Wheeler*; and No. 1490, *Theodore L. Mead*.



Wyndham Hayward

Hybrid Hippeastrum: Salmon Queen

This is the average Leopoldi Type A under the tentative classification; variety introduced by Wyndham Hayward, 1935.

Introduced 1935 by Lakemont Gardens, Winter Park, Florida, Wyndham Hayward, Prop. Seedlings,—No. 458, *Kirby Pink*; No. 600, *Salmon Queen*; No. 601, *Flame*; No. 602, *Strawberry Glow*; No. 607, *Mars*; No. 634, *Full Moon*; No. 641, *Ruby*; No. 645, *Edith*; No. 650, *Ernestine*; No. 651, *Pardy*; No. 652, *Purity*; No. 660, *Goliath*; and No. 662, *Nevoso*.

Introduced 1934 and 1935 by Hamilton P. Traub, Mira Flores, Orlando, Fla. Seedlings,—No. 31, *Will Rogers*; No. 24, *Wyndham Hayward*; No. 42, *Greta Garbo*; No. 29, *Frank Wootten*; and No. 2, *Bert Merrill*.

Introduced 1934 by Mr. Harry Searles, Orlando, Florida,—No. 1, *Harry Searles*.

Introduced 1934 by Mrs. B. A. Dominick, Orlando, Fla. No. 1, *Anne Lindbergh*; No. 2, *Eleanor Roosevelt*.

Fischer Color Chart

The Fischer Color Chart, published by the New England Gladiolus Society, was adopted as the official standard by the American Amaryllis Society in 1933. The publishers have kindly agreed to offer this Chart mounted on heavy cardboard to members of the American Amaryllis Society at \$2.00. Send orders to your Secretary, Mr. Wyndham Hayward, Winter Park, Florida.

3. Breeding

Opportunities for Breeding With Daffodils

DR. DAVID GRIFFITHS, *Senior Horticulturist,*

Bureau of Plant Industry, U. S. Department of Agriculture

A fancier said the other day that we have too many daffodils now. True! But we need better ones and the only way to get them is to make more. There has been great activity in the making of new forms and varieties in the British Isles, less in the Netherlands, and least in the U. S. A. until the last few years. We have lagged behind shamefully with only 3 or 4 in the entire country devoting their attention to the improvement of this queen of spring flowers.

With all the work that has been done in the British Isles and possessions only a part of the field has been covered. The Trumpets and half-Trumpets are well worked by the English breeders, and the Poetaz by the Dutch, but there are tremendous gaps to be filled in. There is no one doing a thing of note with the Polyanthus group outside the Poetaz section. No one seems to have considered it necessary to improve the three great commercial Polyanthus species, *Paperwhite*, *Soleil d'Or*, or *Chinese Sacred Lily*, as many of which are used as all others put together. There is opportunity here for a lifetime of work in the improvement of these strictly commercial forcing stocks and they are compatible. Combinations of them are possible with segregations of characters in the first generation. This we know because we have *Soleil d'Or* (seed parent) by *Paperwhite* (pollen parent) coming on now. They should blossom profusely in 1936 if nothing happens.

Paperwhite is prized as much for its easy and early forcing as for its beauty. Its dead white could be improved upon, and its flowering habit leaves much to be desired. Its early forcing quality needs to be preserved, but it might benefit from some of the color characteristics of *Soleil d'Or*. The species has a narrow range of marketability. Its bulb performs differently from most daffodils. It would be more valuable if its round merchantable bulb could be traded off advantageously for a double-nosed one which would function satisfactorily. *White Pearl* and *Grand Monarch* possess such bulbs now. It would be an advantage to the grower and consumer if a double-nosed *Paperwhite* could be produced which would throw two spikes instead of one. The bane of the grower's existence is to keep his *Paperwhites* from splitting up too much. The other Polyanthus varieties do not offend in this respect.

It will be realized that such improvements must be made in our Southland where these tender forms are so well adapted. The breeder who will put more character in the flower of *Paperwhite* and increase the range of marketability of its bulbs will be rendering a real service.

The Dutch have done a great deal with the Campernelles, but no more than to add to the foundation on which to build a great group of daffodils adapted to our warm southern regions. The so-called hardy daffodils are illy adapted to warm regions. Who knows what may be evolved from the combination of characters of the Polyanthus varieties with the Campernelles and their derivatives and with such semi-adapted varieties as *King Alfred* and *Minister Talma*! There is a much wider base for development here than lies behind the Trumpets which have been multiplied into the most unexpectedly beautiful series of varieties.

In the North there are opportunities all along the line. It has been shown that there are possibilities yet undreamed of in the groups most worked. Breaks are being segregated in crosses between varieties which have been most worked. The need is for someone to take to the breeding of daffodils on true Mendelian lines with a large enough progeny to cover the possibilities of the combination. Small progenies have been the rule in the past. A few seedlings of a cross show only a very small sector of the combinations possible from it. For this reason new segregations are appearing from crosses which have been made many times.



U. S. Department of Agriculture

Narcissus: Thomas Jefferson

Named in honor of the third President who did so much to bring the far Northwest into the Union; U. S. Bulb Farm, Bellingham, Wash.

As a glaring example of this witness what trumpets the Van Waverens have secured from crosses of mediocre varieties. It seems to me that the time has come to strive for all the possible combinations of a cross between two varieties. Instead of a single pod of seed 50 to 100 should be made. This would not only be likely to exhaust the possible segregations but put the breeder in possession of data that is not available now.

There is a nice job here for the amateur and the garden club enthusiast. It has long seemed to me that garden clubs need above all else to have a little attention given to directing their energies. The majority of the membership is capable of doing real plant improvement. Instead of growing over and over again the items that are and those that make an appeal, would it not be vastly more profitable if some of the members took up a group or two with an eye single to its improvement? There is no better field for plant improvement in my opinion today than in the genus *Narcissus*, and every part of it is vulnerable.

In the undertaking no expensive list of varieties must be had, although pedigreed stocks are to be preferred if their parental qualities are proven. Good improvements are possible in the best of the commercial items, for seldom in the past have the progenies been large enough to give but an indication of the possibilities latent in the cross. The main requisite always is to select good seeders for the mothers.

The first 4 years for an undertaking of this kind would, of course, be tedious, but after that the new progenies which come into blossom each spring will furnish zest and stimulus enough for anyone. My experience has been that large progenies such as described above contain not less than 50 per cent of individuals of comparable quality with those listed in the best commercial lists besides an occasional outstanding one.

An interest in the breeding of daffodils among the amateur class of growers would lead eventually to competitive spring exhibits. Such work it seems to me is certain to lead to some permanent benefit to garden science and garden materials.

There is no reason why the same sort of advancement and similar enthusiasm should not be worked up in seedling daffodils as now obtains in the bearded iris. There should be 50 or more growers in this country who exhibit their own seedlings, all different from each other, and all different from anything anyone else has. It will take twice as long as in iris to realize the first fruition, but that is a small matter. One spring show has already been held wherein one amateur exhibited 75 of his own seedlings.

As certain as one starts in on such a venture just so sure is he eventually to discard much of what is and grow his own. The writer went through that experience quite rapidly after starting in with just this kind of a venture. He would have no regrets today if obliged to dispense with the commercial stocks of trumpets and *Incomparabilis*. The 60 selected seedlings of a few years ago would make up the loss quite satisfactorily.

The Nerine, Its Species and Hybrids

P. R. BARR, G. R. BARR, G. H. BARR and H. R. BARR,
England

Nerines are handsome bulbous plants, producing umbels of 6 to 24 blooms in Autumn on stiff erect stems, ranging from one to two feet in height. In most cases the flowers have curling reflexed petals and protruding curved stamens. In colour they range from vivid crimson, cerise, and scarlet to salmon, coral-rose, pink, blush and white, the petals having a glistening lustre, which in sunlight gives them the appearance of being dusted with gold or silver. They remain decorative for many weeks and their beauty may be enjoyed in a sitting-room window as well as in the greenhouse.

The nerines are native of South Africa, the different species being distributed through Cape Colony, the Orange Free State, Natal, and East Griqualand, at an altitude of 1000 to 6000 feet. The bulbs are found growing in stony and rocky ground, sometimes being wedged in between rocks. They are subjected to a long

period of drought, during which time they are exposed to a scorching sun. Then come cooler weather and drenching rains, when the bulbs quickly start into bloom and begin making their foliage, going on growing until the hot weather comes round again, when the foliage dies down and the bulbs once more go to rest.

Culture.—In England nerines are of comparatively easy culture when grown in pots in any glass structure from which frost is excluded in winter, the period when the bulbs make their foliage growth which is soft and very sensitive to frost. At all times the bulbs require plenty of light and air, with as much sun as possible. A moist and warm atmosphere is fatal to them.

The bulbs should be potted up in August, one bulb to a 3½ inch pot, or a larger pot in the case of larger-sized bulbs. The best compost to use is good fibrous loam mixed with coarse silver sand and a little very well-decayed manure.

The only artificial food which may at any time be used is bonemeal. It is most important that plenty of crocks be put into the bottom of the pot to insure perfect drainage. Pot firmly with only the neck of the bulb showing above the soil. If the potting soil is moderately moist no watering will be necessary until the flower bud or foliage is seen to be pushing up. Then give a plentiful supply so that the soil is well moistened. After that only occasional waterings are required until the plants are in full growth, when an application of manure water every few weeks will be found beneficial to encourage a vigorous growth.

In May when the foliage is beginning to turn yellow gradually reduce the water supply, and later place the pots on a shelf in the greenhouse where they can get plenty of light, air, and sunshine, and here let them remain (unwatered), so that the bulbs can ripen off well until August when they should be given a good soaking of water to start the bulbs into active growth.

When once planted nerines should be left in their pots undisturbed for three or four years, an annual dressing of bonemeal being given after they have once started to make their autumn growth.

The finest effects are obtained by planting three or four bulbs in a large pot. When once established these make a glorious show.

In the milder climate of Southwest England, *Nerine bowdeni* and the two grand hybrids *Aurora* and *Hera* may be grown outdoors if planted against a south wall and covered during winter with dry heather or bracken.

Species.—J. G. Baker in his *Handbook of the Amaryllidaceae*, 1888, records 10 species of *Nerine* with 11 geographical sub-species. He also gives a list of 18 interesting hybrids raised many years ago by Dean Herbert (*Amaryllidaceae*, 1837), and Messrs. O'Brien, Max Leichtlin, Cam, etc. Of these species and hybrids very few are in commerce to-day, but some might possibly be found in botanic gardens. The following, however, are to be had:—*N. sarniensis*, *N. sarniensis plantii* and other varieties, *N. flexuosa*, *N. curvifolia*, *N. fothergilli*, and the hybrids, *Mansellii*, and *Meadowbankii*.

Hybrids.—As stated above several hybrid nerines were raised years ago by Dean Herbert and others, but little was done afterwards with this family until Mr. Elliott of Hassocks, Sussex, devoted himself to raising a group of seedlings, which showed a pleasing variety. These were purchased by that great traveller, and naturalist, Henry John Elwes of Colesborne, Gloucester, who had started cross-breeding nerines.* Many beautiful new forms, and colours resulted from his hybridizing. A few years before his death (1922) Mr. Elwes disposed of the major portion of these to our firm, and since that time we have continued making crosses and adding some new and beautiful varieties to the family. These we exhibit annually at the Royal Horticultural Society's autumn shows in London.

A fine species called *N. bowdeni* introduced from the Cape, and of vigorous habit, has proved to be hardier than other species and hybridists set to work to use it as a parent. It was in the second generation that some good results were obtained. Of these by far the finest were the hybrids raised by Mr. J. Rose of Oxford, called *Aurora* and *Hera*. These were purchased by us from Mr. Rose and their descriptions will be found given further on.

Raising from seed.—*Nerine* seeds do not keep well and require therefore to be sown as soon as ripe in pans or pots of a light compost of loam and sand, the seeds being only lightly covered with sand. When the young growths appear give them every encouragement to go on growing, not forcing them to go to rest in summer

* The late Dr. Attilio Ragionieri also produced hybrid nerines.—Ed.

unless they show an inclination to do so. When sufficiently large to handle easily, transplant 12 or more and give the same treatment as required for nerines generally. When the seedling bulbs have become overcrowded in the pans, transplant them 3 or 4 or more to a pot and grow on. No flowers may be expected under five years from sowing.

Descriptions of Hybrids and Species.

Aurora, a splendid hybrid Nerine resulting from *N. Bowdeni* crossed with a *N. Fothergilli Hybrid*, producing in October flowers of great size and substance, *satiny rose* with *silvery lavender* stripe down centre of petals, borne in very large bold umbels, rising from a wealth of foliage. The resting period is after flowering, and it should be kept dry and cool from November to January until growth recommences in February; it should then be watered sparingly until April or May, after which a plentiful supply should be given. Like *N. Bowdeni*, it should flourish outdoors in mild districts, F.C.C., R.H.S.

Barcarolle, beautiful *old rose*, with glistening *silver* and deeper stripe up each petal. *Beacon*, soft shade of *scarlet*, slightly paler at center.

Bedouin, *scarlet-cerise*, large open flower with recurved and waved petals, tall grower.

Berenice, *bright pink* with *rose* stripe half-way up each petal, fine large open flower, good truss.

Betty, *coral pink* flowers changing to *mauve*, large flower with waved petals.

Bowdeni, a fine species from the Cape, producing large umbels of flowers 3 to 4 in. across, *pink* with a *rose* coloured line down each petal. One of the hardiest and may be grown out of doors in the South and West of England. A.M., R.H.S.

Calpurnia, *bright pink*, lighter at margin and centre, petals much waved and recurved.

Comus, glistening *pink* with deeper stripe, broad-petalled flower.

Elegantissima, large trusses of charming *pink* flowers with *rose* stripe down centre of each petal, strong free-blooming variety, rather late flowering.

Felicity, soft *salmon-red* slightly shot *mauve* with *scarlet* centre, large open waved flower.

Flexuosa alba, a distinct species bearing an umbel of about twelve *snowy white* flowers with elegantly undulated and recurving petals. A.M., R.H.S.

Fothergilli major, large umbels of handsome brilliant *salmon-red* flowers shaded *scarlet*, a splendid early-flowering variety, very showy, reliable, and free-blooming.

Her Majesty, glowing *rose-cerise*, deeper at centre and *gold* dusted, large flower, *extra fine*.

Hera, a sister seedling to *Aurora* but rather earlier flowering; the flowers are of great size and fine form, brilliant *rose pink*, with a *deeper rose* stripe down centre of petals, F.C.C., R.H.S.; for cultural note see *Aurora*.

Hilda, *salmon-red* with *gold* dusting, good truss and tall grower.

Ingens, deep *salmon-pink* flowers with *rose* stripe half-way up petal, large truss, early flowering.

Judith, *rose* with faint *mauve flush*, large trusses of open flowers, tall grower.

Knight Errant, bright *rose-crimson*, shot *gold* and shading to *scarlet* at centre, petals waved.

Knight Templar, very large open flowers with recurving petals, brilliant *glistening rose* with *crimson* stripe and centre, tall and robust grower.

Lady Clementina Mitford, an exquisite shade of delicate *shell-pink*.

Lady Folkes, rich *bright clear rose*, excellent spike and truss.

Lady Mary Shelley, large open *soft clear shell-pink* flowers, slightly deeper towards centre, with waved and recurving petals.

Lucifer, growing deep *crimson-scarlet*, flat open flower with slightly recurving petals.

Lydia, *rose-pink* with deeper central stripe, petals recurved and prettily waved, fine truss.

Mansellii, tall handsome variety, having bold heads of *satiny rose-pink* flowers, late bloomer.

Meadowbankii, *fiery orange-scarlet* flowers, petals slightly waved and recurved.

Miranda, a glowing rich *cerise self*, with *crimson* centre, large flowers, good truss, strong grower.

Peter Barr, large open trusses of *glistening rose* flowers deepening towards centre and with sparkling *golden sheen*, of tall vigorous habit.

- Pink Beauty*, pretty flowers of medium size, *bright rose-pink*, with *gold* and *silver* dusting.
- Plantii*, large well-formed trusses of *bright rose-scarlet* flowers, *gold* dusted, *extra fine*.
- Princess Mary*, glistening *pink* with *slightly deeper* stripe, petals waved and recurved, tall grower.
- Queen Alexandra*, *bright cherry-rose*, large open flower with slightly recurving and waved petals, a glowing colour, late.
- Queen Mary*, of tall robust habit with large trusses of handsome *bright pink* flowers with *deeper stripe* half-way up petals which are beautifully recurved, *silver*-dusted.
- Queen Nathalie*, *salmon-pink* with glistening *scarlet* stripe, good truss, tall grower.
- Red Hussar*, large *salmon-scarlet* flowers *gold* dusted, *petals* recurved and waved, a fine large truss and of vigorous growth.
- Robert Berkeley*, *rich salmon-rose shot gold*, large flower and very free-blooming.
- Ronald*, deep *coral-red* with deeper stripe, petals well curled and reflexed.
- Rose Barton*, rich deep *cerise-rose* flowers, long tapering petals, tall grower.
- Rose Beauty*, *ruby-rose* with deeper centre, tall spike.
- Rosella*, large *bright rose-pink* flowers with reflexing petals, well set on a large handsome truss, sturdy grower.
- Salmon Perfection*, perfect large truss of *clear light salmon* flowers, tall strong grower.
- Sarniensis* (*Rose Guernsey Lily*), deep *rose* with deeper stripe, hardy outdoors in mild localities.
- Sarniensis corusca major* (*Scarlet Guernsey Lily*), brilliant fiery *orange-scarlet*, tall grower and free bloomer, may be grown outdoors in mild localities.
- Sarniensis insignis*, clear glistening *salmon-pink* with faint stripe.
- Sarniensis* (*Rose Queen*), large *bright rose* flowers with a *glistening scarlet* bar, petals slightly recurved, tall robust grower and hardy outdoors in the South and West of England.
- Scarlet Beauty*, brilliant *orange-scarlet* self, an exceptionally vivid colour, fine truss.
- Scarletta*, rich *rose-scarlet* self, *gold* dusted, petals prettily waved and reflexed.
- Talisman*, *bright salmon-scarlet* with *gold* dusting, large trusses and flowers.
- Vieux Rose*, a most distinct and attractive shade difficult to describe, the effect being a *dull salmon* with *old gold* suffusion and *vermilion* centre.

The Species of Daylilies

DR. A. B. STOUT, *Director of the Laboratories,*

The New York Botanical Garden

Thirteen distinct species of *Hemerocallis* are to be recognized among the various types that have been named in botanical literature. But in most cases these have been named and described from a few plants that were brought into cultivation in Europe. Evidently several of these species were described when there was only a single seedling plant of each that was being propagated as a clone. A critical study and survey has never been made of the wild daylilies of Asia.

For several years the New York Botanical Garden has obtained living plants and seeds of wild *Hemerocallis* from various localities in Japan, China, Manchuria and Siberia. It is evident from these plants that the older types which were described are scarcely representative of the wild plants and that in several cases at least the older types were either selected as rather unusual plants of wild stock or were produced as seedlings of possible hybrid origin in garden culture. In only a few cases have wild plants conformed closely to the types of botanical literature and two obviously new species, *Hemerocallis multiflora* Stout and *H. exaltata* Stout, have been described. Either there are many more species of daylilies to be named or the species already known are to be considered as widely variable.

The species now to be recognized are as follows:

Hemerocallis nana W. W. Smith and Forrest, *H. plicata* Stapf, and *H. Forrestii* Diels are dwarf or semi-dwarf types recently discovered in southwestern China by the

botanical explorer Forrest. For some reason plants of these species have not thrived in culture in England or America. Already they have been used as parents in hybridization.

Hemerocallis Dumortierii Morren and *H. Middendorffii* Trautvetter and Meyer have long been known in Europe as semi-dwarf, early-flowering, orange-flowered plants with sessile flowers on unbranched scapes. Certain wild plants received from northern Japan conform closely to the types of *H. Dumortierii*, but considerable variation has been observed in wild plants that are to be classed as *H. Middendorffii*.

Hemerocallis flava Linn. has lemon-colored flowers that are odorous; the stature is about three feet tall; and the flowering is in early spring. This Linnaean type is a clone that was first described in 1570 by Pena and Lobel (Historia) under the name of *Asphodelus luteus liliflorous*. Thus far no plant has been received by the writer from the Orient which resembles this plant.

Hemerocallis minor Miller. This name was bestowed by Miller in 1768 to plants then in cultivation in England which were of smaller stature than the *H. flava*. Miller's description is meagre but the name may be applied to certain plants that are early-flowering and yellow-flowered. The leaves are narrow; the scapes are branched; and the capsules are narrow-elliptic. Plants of this type are grown under the names of *H. graminea*, *H. gracilis*, and *H. graminifolia*; but certain plants with these names are obviously hybrids.

Hemerocallis Thunbergii Baker. Flowering in mid-summer; scapes stiffly erect to a height of 45 inches; flowers lemon-yellow, and fading or wilting in the afternoon during hot sunny weather. The capsule is broadly blunt at the apex and much smaller than the capsules of *H. flava*. Baker had of this species only a single plant which was growing at the Royal Botanical Garden at Kew, England. Evidently this species is widely distributed in the Orient and is somewhat variable. There are many hybrids of which this species is a parent.

Hemerocallis citrina Baroni. Flowering in mid-summer; flowers fragrant, pale-yellow, nocturnal; perianth tube elongated and the segments narrow. The type clone has an excellent and robust habit of growth and attractive dark green foliage. It has been much hybridized especially with *H. Thunbergii*. Some of the hybrids as the Ophir Daylily and Parthenope surpass the parent species in having large full flowers of good day-blooming habits and richer color. This species is itself comparatively of no value as a garden plant.

The *Hemerocallis multiflora* Stout flowers in late summer and autumn; the scapes are much branched; the flowers are orange-colored and of small size. Already many hybrids with this species as a parent have been produced which exhibit a wide range of coloring in the flowers and which bloom in late summer and throughout the autumn.

The *Hemerocallis exaltata* Stout has orange-colored flowers on tall erect scapes that end in short coarse branches. This very distinct type was obtained from the Tobi Shima Islands off the west coast of Japan. It is not a valuable garden type but some of its hybrids may prove to be of interest and value.

The *Hemerocallis aurantiaca* Baker was described from a single clone which was growing at the Royal Botanical Gardens at Kew, England. It is stated in the Somoku-Dzusetu that this type grows wild in the region of Mount Ibuki, Japan. Baker's plant has evergreen foliage, the flowers have a faint tinge of fulvous coloring over an orange base and the time of flowering is in July. Usually the descriptions of this plant fail to note the faint tinge of fulvous coloring in the face of the flowers.

Hemerocallis fulva Linn. The plant which Linnaeus thus named (Species Plantarum, ed. 2, 1762) has long been widely grown in Europe. It was described by Lobel in 1576 under the name *Liriosphodelus phoeniceus*. It is now known that this plant is a triploid clone that never produces seed to self-pollination. It has become one of the most cosmopolitan of cultivated plants for it is grown in tropical, subtropical, and temperate regions. The writer has applied the name Europa to this horticultural clone to distinguish it from the numerous other clones in cultivation and from the wild types which are to be included in the species *H. fulva*.

The Europa Daylily with its strongly fulvous colored flowers may be considered as the historical type of a variable species that is widely distributed in the Orient.

To be included with this species are certain double-flowered triploid clones known as Kwanso and Flore pleno and also single-flowered types as *H. disticha* Donn,

H. longituba Miquel, *H. fulva longituba* Maximowicz, and *H. esculenta* Koidzumi. There are several other varietal names that have been given to individual plants of the fulvous group. A rather distinct type with rosy pink flowers has recently been described and named *H. fulva* var. *rosea* Stout.

CONCLUDING REMARKS

These thirteen species of daylilies, including the variations already obtained from the wild, afford excellent material in a wide diversity of types for use in breeding in the work of developing new hybrid races and clones of distinct merit for horticultural uses.

Already members of all of these species have been used in hybridizations and selective breeding. The writer has made most of the hybridizations possible for these species and also for certain new but unnamed types and has grown a total of over 50,000 seedlings. About 300 of the best of these have been selected for critical study and for use in further selective breeding. Several of the most outstanding have been named as horticultural clones. Breeding of daylilies was begun about 1890 chiefly in England and Italy and the work has progressed until about 200 hybrid seedlings have now been named as horticultural clones.

With few exceptions the species have all been decidedly surpassed as desirable garden plants by certain of their hybrid offspring and hence few of the species will continue to be grown in flower gardens.

Louis Percival Bosanquet and His Crinums

WYNDHAM HAYWARD, *Florida*

The unsurpassed delicacy of the rose-purple shading of the hybrid *Crinum* "Ellen Bosanquet" places it in the fore of this class of sub-tropical garden novelties. It is the masterpiece of the late Mr. Louis Percival Bosanquet, of Fruitland Park, Lake County, Florida, who named his choice creation after his wife.

Mr. Bosanquet was born in Southgate, England, July 20, 1865, and came to the United States in 1888, eventually settling at Fruitland Park, where an older brother, Augustus Bosanquet had set out an orange grove. Louis Bosanquet later took over his brother's interests when Augustus went to live in Lisbon, Portugal.

Louis Bosanquet was an English Gentleman in all that the name implies. Possessed of a private income beyond the returns from his Florida properties, he established a homestead and country place on old Southern lines that is still one of the show places of Central Florida. He devoted himself sincerely to horticulture in many branches, importing bulbs and plants from many parts of the world, and built up one of the finest collections of *Crinum* species of his time.

He died April 19, 1930, and since that time his crinum collection has fallen into confusion; unfortunately the identity of most of the species having been lost. Much of his knowledge of his plants was not written down and with his passing there disappeared a fund of information which should have been made available to later plantmen.

Mr. Bosanquet added to the collection of rare plants begun at Fruitland Park by his brother. The surroundings of the Bosanquet mansion to this day resemble a miniature botanic garden. Spreading giant live oaks and bamboos, shrubs, vines and various flowering plants are plentiful, but above all there are crinums in pots, tubs and boxes, in rectangular gardens, in rows and semi-circles. During the spring and summer the succession of bloom is almost unbroken.

The species which Mr. Bosanquet hybridized to produce his "Ellen Bosanquet" are not known, but its main difference from other hybrid crinums is the wine color, whereas the hybrids usually run to the pink shades. Another later hybrid crinum, which has been named "Louis Bosanquet" in his honor posthumously, is now in the trade, but is still a rarity.

Mr. Bosanquet was a friend of the late Mr. Henry Nehrling of Gotha, Fla., amaryllis fancier, and they frequently exchanged plants. He was also a cooperator of the U. S. Department of Agriculture. He was a rose enthusiast, and bushes 40

years old are still growing in the Bosanquet gardens where he planted them. He married Miss Ellen Lewis Hall on November 4th, 1891. His son, Alfred P. Bosanquet, lives on the old homestead with his family at the present time, and during the summer of 1934 the son and his charming wife showed Dr. Hamilton P. Traub and the writer around the scenes of the elder Bosanquet's horticultural activities.

The crinum "Ellen Bosanquet" has been introduced into England, and promises to spread to all parts of the world where beautiful flowers and attractive plants are grown. A study of the bloom would lead to the conclusion that it bears the blood of *C. kirkii* or *Z. zeylanicum*, crossed with one of the "Powelli" or "Longiflorum" types. The blooms are borne in clusters, from a stem of medium height. They are slightly drooping. The bulb is round at maturity, and a fairly rapid propagator naturally. It grows to six or more inches in diameter.

Peter Henry Oberwetter, A Texas Amaryllid Pioneer

REV. C. W. HALL, *Texas*

If cost of tombstone were indicative of the deceased's earthly contribution one would of necessity relegate Peter Henry Oberwetter to the realm of the unimportant. Only by reference to the records of the cemetery keeper can it be ascertained that in a certain plat, marked merely by a simple curb enclosure, a small clump of shrubs, and a stately cedar, lies the body of this individual. A passerby, if he should give the matter any thought at all, would presume that the body lying here made no worthwhile contribution to the sum total of human happiness.

If, on the other hand, the degree to which the deceased had created and disseminated beauty, thus assisting in the satisfying of one of humanity's inherent hungers, is a measure of his contribution to his generation and to future generations, one must give to him whose body lies in this unmarked grave a place of unusual honor. None of the rare bulbs for which he had such a fascination, and whose beauty and usefulness were enhanced by his botanical skill, adorn his resting place, but their lineal descendants are to be found beautifying the yards of flower lovers in many sections of our nation, and perhaps in the yards of many foreign countries. For Mr. Oberwetter was an importer of rare bulbs, an exporter of native bulbs, and a creator of new varieties of bulbous plants by hybridization.

Information regarding this Texas pioneer in the field of the Amaryllidaceae has been difficult to secure. His six sons are dead. A daughter lives in a distant state. To a daughter-in-law, who perhaps remembers more of him and his work than does any other, the writer is indebted for most of the rather meager information he has been able to secure. He was born in Germany January 8, 1830, and died in Austin, Texas, May 21, 1915. He was related to the royalty of his native country, and because of his marriage to a peasant girl incurred the displeasure of his relatives. He also incurred the ill will of governmental officials by his opposition to service in the army. Because of these situations he left Germany, came to America, and made his home at the little town of Comfort, Texas. This was shortly before our Civil War. Upon the approach of the Civil War he again expressed his dislike of war by temporarily removing himself to Mexico. While in Mexico he manifested his interest in rare plants by making shipments of bulbs from that section to other parts of the world. After the close of the war he returned to Texas and spent the major portion of his later life in Austin. It was while residing here that he made his most worthwhile contributions to the propagation of members of the Amaryllis family.

The daughter-in-law mentioned above says Mr. Oberwetter repeatedly told her he was the first to import *Hippeastrum johnsoni* into the United States. The writer would like to know whether any one can prove or disprove the accuracy of this claim on the part of Mr. Oberwetter. It seems possible that in the intervening years since Mr. Oberwetter's death confusion of the *Hippeastrum johnsoni* with the fall-flowering miniature *Hippeastrum* may have arisen. The writer feels that it is entirely probable that Mr. Oberwetter was the first to import the latter.

Two or three aged individuals here in Austin recall with interest Mr. Oberwetter's experiments with hybridizing of the Amaryllis (*Hippeastrum*), and of his producing a new strain, but none know what became of his creation. The statement of these is in harmony with the following translation of a reference found in Henry Nehrling's "Die Amaryllis", published in 1909: "Mr. P. H. Oberwetter in Austin, Texas, another friend of Amaryllis, also used *H. psittacinum*, which he crossed with van Eaden's 'Fidelio' and 'Count Cavour'. He produced a variety of singular hybrids, not especially colorful, but extraordinarily prolific of bloom, that proved exceptionally resistant to the Texas climate." It is indeed unfortunate that all trace of this strain has been lost.

Perhaps Mr. Oberwetter's most valuable importations were the *Lycoris squamigera* and *Habranthus miniatus*. After Mr. Oberwetter's death in 1915 his stock of bulbs was sold to a local nurseryman. In the collection were something like two hundred *Lycoris* bulbs. Not knowing the true worth of this bulb, nor the slowness with which it is propagated, the nurseryman sold the major portion of the bulbs. It was not long until he realized that he had let slip from his hands the nucleus of a valuable stock of this rare bulb, and that the few he had left were far too few to replenish his depleted stock by their slow reproduction. Only a few of the *Lycoris* remain in this section. Because of the ease and rapidity with which they are propagated the *Habranthus* has not been lost but has increased in numbers until we now have here in Austin what is perhaps the largest supply of this choice bulb to be found in the entire nation. Although a native of Chile it has proven itself to be exceedingly well adapted to our Texas climate and is rapidly proving its adaptability to the soil and climatic conditions of many other states.

These members of the Amaryllis family are the monuments to the memory of Peter Henry Oberwetter. Perhaps in some section of his adopted state the Amaryllis which he created may be flowering still. Here and there a *Lycoris* may be found whose progenitors were taken from his garden. In many parts of the world the pure white Texas Rain Lily springs suddenly into flower after the summer showers, due to the fact that he shared it with sections in which it was not native. In numerous Texas gardens and elsewhere the bright red *Habranthus* each fall testifies to the work of him who may rightly be called the pioneer in the propagating of the Amaryllaceae in Texas.

A List of Amaryllaceae Cultivated at Isleworth, Near London, 1896

A. WORSLEY, *England*

One hundred and eleven species and varieties are included, but all undoubtedly hardy kinds which have become common in gardens are omitted. Stove kinds are marked 'S'; Intermediate kinds 'I'; Greenhouse 'G'; those that will flower out of doors in summer but which are not hardy '½ H'; hardy kinds 'H'.

1. *Hippeastrum aulicum* ½ H. G.
2. *Hippeastrum aulicum*, hybrids of ½ H. G.
3. *Hippeastrum aulicum*, var. *Robustum* [Fl. des Serres] G.
4. *Hippeastrum equestre* S. to I.
5. *Hippeastrum equestre*, major [*ignesciens* of Gardens] S. to I.
6. *Hippeastrum equestre*, *prunum* [of Koch] S. to I.
7. *Hippeastrum equestre* from Burmah, very small S. to I.
8. *Hippeastrum equestre alberti* [double flowers] S. to I.
9. *Hippeastrum equestre* from Costa Rica [Wolteri] S. to I.
10. *Hippeastrum reginae* I
11. *Hippeastrum reginae spectabile* [Loddige] I
12. *Hippeastrum rutilum fulgidum* var. *ornatum* ½ H. G.
13. *Hippeastrum rutilum fulgidum* hybrids of, such as
 carnarvonia, etc. ½ H. G.
14. *Hippeastrum rutilum sub-barbatum* [Herbert] ½ H. G.
15. *Hippeastrum solandriflorum* S

16. <i>Hippeastrum solandriflorum</i> hybrids of	S.
17. <i>Hippeastrum stylosum</i>	S.
18. <i>Hippeastrum rubrum</i> [New Species]	
19. <i>Hippeastrum vittatum</i>	$\frac{1}{2}$ H.
20. <i>Hippeastrum vittatum</i> hybrids of	H.
21. <i>Hippeastrum procerum</i>	G.
22. <i>Hippeastrum</i> hybrids of Veitch's strain	G.
23. <i>Hippeastrum</i> hybrids of Continental strains	I.
24. <i>Habranthus advenum</i>	G.
25. <i>Habranthus brachyandrum</i>	H.
26. <i>Habranthus brachyandrum</i> hybrids of	H.
27. <i>Habranthus pratensis</i> [fulgens of some]	H.
28. <i>Habranthus roseum</i>	$\frac{1}{2}$ H. (?) G.
29. <i>Phycella</i> species	G.
30. <i>Zephyranthes brachyandrum</i> [habranthus]	H.
31. <i>Zephyranthes brachyandrum</i> hybrids of	H.
32. <i>Zephyranthes carinata</i>	$\frac{1}{2}$ H. G.
33. <i>Zephyranthes</i> species Cuba	I.
34. <i>Zephyranthes tubispatha</i>	I.
35. <i>Zephyranthes verecunda</i>	G.
36. <i>Sprekelia formosissima</i>	$\frac{1}{2}$ H. G.
37. <i>Hymenocallis filamentosa</i> (new species)	I.
38. <i>Hymenocallis littoralis</i>	G. to I.
39. <i>Hymenocallis moritziana</i> [Baker]	S.
40. <i>Hymenocallis speciosa</i>	I.
41. <i>Hymenocallis</i> species Brazil	S.
42. <i>Hymenocallis</i> species Ceylon	S.
43. <i>Ismene amancaes</i>	$\frac{1}{2}$ H. G.
44. <i>Ismene calathina</i>	$\frac{1}{2}$ H. G.
45. <i>Ismene macleana</i>	$\frac{1}{2}$ H. G.
46. <i>Ismene pedunculata</i> [Herbert]	G.
47. <i>Ismene</i> species [undulata of Gardens, non Baker]	G.
48. <i>Pancratium canariense</i>	I.
49. <i>Pancratium canariense</i> seedlings	I.
50. <i>Pancratium illyricum</i>	H.
51. <i>Pancratium maritimum</i>	G.
52. <i>Pancratium maritimum</i> hybrids	G.
53. <i>Pancratium zeylanicum</i>	S.
54. <i>Pancratium</i> species Japan	G.
55. <i>Eucharis amazonica</i> var. <i>fragrans</i>	S.
56. <i>Eucharis sanderi</i>	S.
57. <i>Hyline</i> (new species, larger than <i>gardneriana</i>)	I.
58. <i>Elisena longipetala</i>	G.
59. <i>Urceolina latifolia</i>	I.
60. <i>Urceolina miniata</i>	I.
61. <i>Eurycles cunninghami</i>	I.
62. <i>Eurycles silvestris</i>	S.
63. <i>Eurycles</i> , species	S.
64. <i>Eurycles</i> very small and distinct	S.
65. <i>Narcissus monophyllus</i>	G.
66. <i>Stenomesson aurantiacum</i>	G.
67. <i>Stenomesson incarnatum</i>	G.
68. <i>Phaedranassa carmioli</i> [refugium botanicum]	S.
69. <i>Phaedranassa chloracea</i>	G.
70. <i>Phaedranassa fushoides</i> (of Gardens)	G.
71. <i>Phaedranassa obtusa</i>	G.
72. <i>Phaedranassa ventricosa</i>	G.
73. <i>Griffinia dryades</i>	S.
74. <i>Griffinia dryades</i> var. <i>petiolata</i>	S.
75. <i>Crinum amabile</i>	S.
76. <i>Crinum fimbriatulum</i>	I.
77. <i>Crinum giganteum</i> [nobile of some]	S.
78. <i>Crinum latifolium</i> [campanulatum of some gardens]	G.

79. <i>Crinum moorei</i>	H. or G.
80. <i>Crinum moorei</i> var. <i>schmidtii</i> [distinct from <i>alba</i>] ... ½	H. or G.
81. <i>Crinum powellii</i> (hybrid)	H.
82. <i>Crinum pratense</i>	G.
83. <i>Crinum scabrum</i> [from America]	I.
84. <i>Crinum scabrum</i> hybrids	I.
85. <i>Crinum submersum</i> (?)	I.
86. <i>Crinum zeylanicum</i>	I.
87. <i>Crinum</i> species Brazil	S.
88. <i>Crinum</i> species Ceylon	S.
89. <i>Crinum</i> species Surinam [probably <i>graciliflorum</i>]	S.
90. <i>Brunsvigia cooperi</i>	½ H. G.
91. <i>Brunsvigia josephinae</i>	½ H. G.
92. <i>Brunsvigia josephinae</i> bi-generic hybrids	½ H. G.
93. <i>Brunsvigia</i> species	G.
94. <i>Ammocharis falcata</i>	½ H. G.
95. <i>Haemanthus multiflorus</i> var. <i>kalbreyri</i>	S.
96. <i>Haemanthus multiflorus</i> var. <i>kalbreyri</i> seedlings	S.
97. <i>Haemanthus</i> species Cape	G.
98. <i>Haemanthus</i> species Natal	I.
99. <i>Imhofia crispa</i>	G.
100. <i>Nerine sarniensis</i> var. <i>corusca</i>	½ H. G.
101. <i>Nerine pudica</i>	G.
102. <i>Nerine pudica</i> hybrids	G.
103. <i>Nerine</i> species Japan	G.
104. <i>Lycoris aurea</i>	I.
105. <i>Lycoris radiata</i> [<i>Nerine japonica</i> of Gardens]	½ H. to H.
106. <i>Lycoris sanguinea</i> [in two varieties]	½ H. G.
107. <i>Lycoris squamigera</i>	H.
108. <i>Lycoris</i> species (narrow leaves)	G.
109. <i>Lycoris gastronema sanguinea</i>	S. to I.
110. <i>Vallota purpurea</i> var. <i>minor</i> [brilliant color, very dwarf] ½	H.
111. <i>Amaryllis belladonna</i> hybrids	H.

My Father's Work With Amaryllis

ARNO H. NEHRLING, *Massachusetts*

It gave me much joy and pleasure when I learned that the first volume of the "Year Book" of the American Amaryllis Society was to be dedicated to my father as a memorial. This is the type of recognition he would have appreciated. Since his work was pretty well covered in the various articles which appeared in this first issue, little remains to be said. Yet I could not refuse the request of the Editor when he asked me to write a brief story on my father's work with amaryllis as I knew it. I will record briefly a few facts as they come to my mind.

In my work in the horticultural field I have come in contact with many nature lovers but none as ardent or with the enthusiasm that my father possessed. He was a true nature lover. His interest in birds and plants was more like that of the poet, artist or musician. When he became interested in a new plant or when a new species or variety appeared in his garden or greenhouse, he often forgot the material things in life. He absolutely detested a business transaction of any kind.

My grandfather when discussing my father's boyhood days, with a twinkle in his eye, made it a point to mention how his son Henry at an early age would wander all over the home farm in Wisconsin studying the habits of the native birds and plants. He would of course try to share some of the discoveries he made with those around him and his enthusiasm was so great that he was considered a little queer even by his parents, to say nothing of his neighbors. My grandfather also told me that as a boy my father's ambition was to have a huge wire cage on the farm where birds could be confined yet where they could fly to their heart's content while being studied by the bird lover. Later these cages really came into existence and when my father

first saw the huge bird cage in Forest Park in St. Louis, he felt that his boyhood ambition had been realized.

After my father graduated from the Teachers Seminary in Addison, Ill., he first taught school in Chicago. From there he received a call to Houston, Texas, to take charge of a Lutheran Parochial School. He arrived in Houston in early April and since he had never been South, he was tremendously impressed with the balmy climate, especially since coming from Illinois where the weather at that time of the year is often very disagreeable. Before reporting to the school authorities, he wandered aimlessly about in this semi-tropical city and he was attracted by the fragrance of the gardenias, the beauty of the tea and climbing roses and the splendor of *Magnolia grandiflora*. He also heard for the first time the song of the mocking bird and the chirp of the cardinal. However, the discovery that gave him the greatest joy was a clump of striped glowing red flowers which he could not identify from a distance. He quickened his steps and was almost overjoyed when he discovered a huge planting of *Hippeastrum Johnsonii*. The group was surrounded by palms, cycads, pampas grass and other subtropical plants which gave them an ideal setting. My father never lost his enthusiasm for this wonderful picture and although he subsequently became interested in orchids and other rare plants he never allowed his love for amaryllis to be crowded into the background. The name amaryllis seemed to have for him a poetic ring which never grew old.

After he became established in Houston, he planted as many *Hippeastrum Johnsonii* as he could obtain. This was the beginning of his collection of amaryllis. New species and varieties were added from time to time and the bulbs were moved from Texas to Missouri as my father at his own request was transferred to another Lutheran School located in the Ozark Mountains region. It should be understood that during all this period a study of the birds of North America was really a paramount issue with my father as he had started work on a book on the North American birds shortly after his graduation from the Teachers Seminary.

From Missouri the Nehrling family moved to Milwaukee, Wisconsin, where, because of my father's interest in natural history, he became director of the Public Museum, an institution which due to his efforts has become one of the leading museums of its kind in the country. In the year 1890 my father was able to build a small greenhouse in the rear of the Nehrling residence and it was at this point that his real work with amaryllis began. To his collection of *Hippeastrum Johnsonii*, *H. Acramannii pulcherrimum* *H. reginae*, *H. equestre*, *H. solandriiflorum conspicum*, *H. leopoldi*, he added *H. vittatum* and its best hybrids. As funds became available, he acquired a collection of De Graaff's and Veitch's available sorts. Now began the extensive hybridizing work and this is where the writer of this story received his first introduction to the Amaryllis Family. My brothers were away at college so at the age of nine I became, much to my sorrow, at least I felt that way at the time, my father's chief assistant. Some of the work was extremely interesting even for a boy while some of the other tasks were strenuous and most uninteresting, especially when in a vacant lot nearby all the other boys in the neighborhood were engaged in their favorite sports. It was quite a joy, however, when my father allowed me to make some crosses and later gather the seeds and plant them in shallow flats. The majority of these seedlings, of which we sometimes had as high as 30,000, were grown on for a season and then packed and sent to Gotha, Florida, to be grown on into flowering sizes. A few out of each cross were saved and allowed to flower so that notes could be taken on them and the best ones used for further hybridizing work. This was the beginning of the Nehrling Strain which soon became known to amaryllis lovers at home and abroad. The late Jacob Eisele of the Dreer firm in Philadelphia, contracted for all the available bulbs for a period of years. The demand became so great that the stock of flowering-sized bulbs soon became exhausted. Had funds been available, this business could have been extended to immense proportions as there was at that time a tremendous interest in amaryllis culture. It was at this time that my father became interested in fancy-leaved caladiums, first of all because they offered a new field for hybridizing work, but primarily because it was possible to produce a salable crop of tubers in a short period of time. As a result the large-scale amaryllis production suffered, but this may have been an advantage as far as the present strains are concerned because work from that time on had to do with crosses of strains and varieties of unusual merit.

In connection with this work my father's correspondence became tremendous. A good many of the letters he received were most interesting and resulted in many fine friendships which continued during the remainder of his life. These letters came not only from horticulturists but from botanists, plant collectors and plant enthusiasts as well. As stated in the "Year Book" of last year, my father met a number of these men from foreign countries at the International Plant Science Congress held in Ithaca, N. Y., in 1926 and he counted this experience as one of the happiest times of his life.

I have spoken only of the success attained in this early hybridizing work and I should add that there were also many failures and disappointments. This meant that thousands of seedlings were often discarded even after they had reached the flowering stage. When some other hybridizer succeeded in obtaining better results than he, my father would admit it without hesitation and discard thousands of seedlings.

As to the ultimate goal in his breeding work with amaryllis, a few words are in order. Although he was interested in increasing the size of the flowers, he sought primarily the elimination of the stripes in the blood red varieties. This he practically accomplished and in his later work, he was interested in producing pink and flesh colored varieties. To my knowledge he was never particularly interested in producing a white strain simply because he felt that there were good white crinums and equally good trumpet-shaped white flowers in the Lily Family.

Some of the Newer Daffodils

MISS MARY MCD. BEIRNE, *Virginia*

In writing of daffodil introductions for our American gardens it is almost impossible for the experienced grower to think of these new-comers as distinct and apart from many old friends among the genus.

The latter class of flowers having withstood one's trial-garden tests, over a period of long and eventful years, naturally deserves a careful and studied comparison for it is by such effort that we may satisfactorily ascertain what special plants prove of greatest practical value for our gardens. Also those varieties that are best adapted to our various needs.

One encounters many hybrid novelties of today, possessing seemingly the one bare virtue of being *NEW*. It is well therefore to be constantly fortified against possible temptation, and the safest plan to follow possibly is fourfold: Go forth armed with the knowledge and understanding of one's own garden plants: Observe the habits and appearance of these same plants in the gardens of others: Visit Daffodil Shows, preferably staged in different sections, of the country: And lastly endeavor to judge such shows, where possible; if one be prepared through practical experience, careful reading and studied observation. All of these factors contribute their quota toward a gradual and unconscious ideal one eventually forms of the perfect garden daffodil flower: Or what most nearly approximates it.

Grouping our subjects for comment according to the classification of the Royal Horticultural Society: We properly begin with the first of eleven horticultural divisions, which happens to be the class Trumpets, with its sub-divisions. It is impossible for the writer to frankly contemplate this class without scrutinizing each new introduction: almost unconsciously yet vividly, against a background of none other than the little old-fashioned early yellow Trumpet of our Southland: A variety known familiarly as *N. spurious* or Trumpet Major and which is considered to closely resemble *N. Princeps*.

But let it be understood: That not by the wildest stretch of imagination could this modest but graceful and charming plant be compared with anything remotely resembling the so-called "Show" flower of today. But so delicately is its small Yellow Trumpet proportioned and so soft is its pale primrose color that either naturalized in small groups or grown in expansive colonies, it proves itself to be of equal grace and beauty.

Thus it may be boldly claimed, that if one has an appreciation of springtime freshness and purity: It must be agreed that *N. spurious* en masse, is quite incomparable in the complete simplicity of its charming loveliness.

Therefore, it is by a comparison of values only, that one jealously eyes the new hybrid Yellow Trumpet, seeking entrance to our gardens of today. Almost unwittingly the question evolves itself: Will this hybrid novelty make up to us in beauty (which is interpreted to mean form, substance, color etc.): what our old long and well-beloved *N. spurious* has furnished in delicacy, adaptability and greatest of all; incredible hardihood? For it is a matter of record that hybrid stocks have perished where *N. spurious*, arriving in Virginia with the early settlers, has thriven on garden neglect and decay.

It is thus, fired by these simple experiences of a pioneer past, that we approach the great class of Yellow Trumpets of today: and dare to set a standard, with an old flower that many would pass unnoticed, in our quite mad but altogether modern quest for size.

The best small uniform Yellow Trumpet for general garden use at RHODEEN, is *Dawson City* (v. Tubergen 1925). The flower is of very perfect form, but sadly, will never win a first award at the show table; unless we learn to regulate our exhibits according to the very admirable English custom. The Royal Horticultural Society qualifies its awards by such additions as: Variety for Show, Garden Decoration, Rock Garden, Forcing, Cutting, etc.

If this rule were adopted here, many desirable and useful flowers would not be overlooked, in competition with a plant that is preeminently a Show variety, such as *Crocus* (Will., P. D. 1927). This is one of Mr. Williams very finest productions. The color is an intense gold throughout and deepens to a rich dark orange with age. Mrs. Davis grows this flower to perfection in her daffodil garden of priceless gems, at Nashville, Tennessee.

Kandahar (Brodie, 1927) is another superb garden plant, with an immense vase-shaped Trumpet borne on tall stems well above the broad strap-like foliage. The color is a very telling deep solid self gold throughout. But one must wait a little while for a plant of this price to attain the much coveted increase.

Lord Antrim (Guy Wilson, 1927) makes a stunning garden picture, having unusual height and vigor. It has fine form and good color but at Rhodeen we prefer the soft lovely primrose yellow of *Apotheosis* (v. Tuberben). Despite its rather dwarfish stature, not quite of the proper proportion to carry a trumpet of such size, it is a very beautiful flower and decidedly distinctive in the Yellow Trumpet class. Mr. Hoog to whom we owe a great debt of thanks for this and so many other lovely flowers, writes us, that the plant is never very tall in his nursery at Haarlem, Holland.

Evidently its normal height was exceeded by some strange accident in one of my own garden plots, several years ago. For the three flowers that were exhibited at a state show that spring, created quite a sensation. The stems were very tall and strong, and the blooms unusually uniform, according to experienced judges present.

Among White Trumpets, it is difficult to choose, for all are refined flowers of great beauty. *Corinth* (Brodie, 1928) unlike many fragile companions of its class, is a plant of strong constitution. A child of Nevis by Beersheba, it is considered by many, to be even more lovely than the parent flower. Certainly the vigor and rare beauty, which go hand and hand, with this very charming creation, are to be heartily commended. Its perianth which is broad and flat, is purest white, and of the finest substance. The trumpet opens pale yellow, fading gradually to a very beautiful soft ivory.

Kenbane (Guy Wilson, 1927) gave late bloom this year but appeared in finer form than we have ever seen it. The great bell-shaped creamy white trumpet contrasted finely with the deep blue-green of its heavy foliage. The flowers held their shape and retained their freshness for a seemingly indefinite time, possibly due to the unusually cool weather.

Savonorola, one of Brodie's 1916 introductions, is still treasured, possibly for sentiment's sake together with its very pure whiteness. *White Conqueror*, a Backhouse seedling, is a much better garden plant however and is strongly recommended.

To Brodie we are indebted for two especially charming flowers in *Eskimo*, whose trumpet opens pale primrose but passes to an intensely pure white. And *Nevis* another pale bicolor seemingly, on first opening, but changing to a clear cool milk-white throughout. Both plants have furnished healthy increase as well as prolific bloom during six happy, fruitful years in my possession.

Neither of these fine acquisitions however, can rival or excel two of Mr. Engleheart's superlative hybrids, which are numbered among my most treasured posses-

sions. *White Emperor* in form, purity of color and habit is everything that one might desire in a perfect garden plant: While *Snowscape* is a flower, not so large as some of its neighbors, but of the purest white and most lovely form.

Rob Berkeley, (Mrs. Berkeley, 1922) is another White Trumpet of medium size, which is finely proportioned and of exquisite form and balance. Such sheer loveliness one would not associate with prolific bloom or vigorous increase which are other desirable attributes of this very fine flower.

Bicolor Trumpets, as a class, have consistently proven of such poor constitution in my trials that I am wary of further investment unless reasonably sure of what I am getting. Such old standbys as *Carmel* (Brodie, 1926) and *Tapin* (Richardson, 1926) are still with me. But in future we shall hope to supply ourselves from my own fine seedling daffodils. The plants give every promise of furnishing ample vigor for what they may possibly lack, in perfection of form!

Among Giant Yellow Incomparabilis, *Fortune* (W. T. Ware, 1923) is of course the most conspicuous flower of its class. Its value is said to be extreme earliness, good form, fine size, great height and brilliant color. Little more could possibly be desired for the superlative flower of our dreams. Personally, the writer must acknowledge that she is wholly unorthodox and remains entirely unmoved, after viewing exhibition blooms, grown in many different localities. There is always left an impression of coarseness and none too lovely form, despite higher authorities to the contrary.

At least there is rejoicing at Rhodeen, that £15 paid by a friend for one bulb of this much heralded flower, is not a subject to be lamented here together with £7, regrettably wasted on *Damson* (Will., P. D., 1925). The latter flower suffers from a very serious defect in a streaked yellow color at the base of its creamy-white perianth. The cup is supposedly deep red. But as it bloomed in my own garden, there is every reason to believe that the virtues so vividly described, are seriously exaggerated.

Bodilly (Will., P. D., 1925) on the other hand is everything that is claimed for it and a fine representative of the bicolor class of Incomparabilis. The plant is of immense stature carrying a bloom of grand quality, especially recommended for exhibition. The broad overlapping perianth is of thick waxy substance with a large bright lemon-yellow cup beautifully frilled at the mouth.

Nissa (Brodie, 1925) is another flower of high quality. A seedling from Kingdom, one may trace its good form and the fine substance of an even-rounded overlapping perianth, and a clear lemon crown. At Rhodeen, it is used mainly in the capacity of a seed parent for which purpose, by the way, it is highly recommended.

Festive (Back., Mrs. 1923) and *Kennack* (Will., P. D. 1927) are both outstanding plants for garden decoration and all that are to be desired in vigor, attractive form and fine color. *Festive's* bowl-shaped crown is tipped with a bright orange band, while *Kennack* boasts a telling rich solid orange cup.

Folly (Will., P. D. 1926) has been intentionally reserved for the last as it is possibly the best beloved of all Bicolor Incomparabilis flowers. There is great charm about its finely pointed petals with their dainty reflex. The cup is solid orange-red and it developed in all its perfection for me this spring. Perhaps it was grateful for the bit of woodland shade that protected and preserved its color. Under my, sometimes uncertain cultivation, the amount of color in the cup varies with the season. But this flower's entrancing profile is always enjoyed, also the brilliant color of the cup when one is favoured with it.

Among Yellow Barrii, *Tredore* (Will., 1927) is one of the finest of its class, having very great substance and a splendid cup of deep solid red. *Treskerby*, another popular variety of Mr. William's raising, is a great favourite for Show and appears to hold its color well, as does *Tredore* which has figured prominently in this distinguished hybridist's seedling exhibitions abroad.

Galata (Brodie, 1927) promptly suggests itself, as being doubtless the most striking giant flower, to best exemplify the great beauty of the White Barrii section. The ivory white perianth contrasts beautifully with an expanding saucer-shaped crown of clear yellow, edged with a very brilliant broad red rim. *Dick Turpin* (Crosfield) is another flower of keen contrasts in clear red margins on marble-like whiteness.

Kilter (Will., P. D.) completes this splendid trio and deserves everything fine that is said of it except that the flower is a "Glorified Firetail". For neither plant could possibly serve as a substitute for the other and all sensible gardeners will insist upon having both.

The Giant Leedsii section is so generally popular with the gardening public, and offers such a vast collection of different types of flowers, old and new, that a compromise between the two seems the best policy in making selection.

My first and very best choice however is *Nacos* (Engle., 1923). Of exquisitely beautiful form, it might be said to be of Ajax proportions. But in spite of its size, the whole flower is of the most superlative quality. The perianth is composed of overlapping pointed segments and the crown is somewhat trumpet-shaped, neatly reflexed at the brim, and purest white throughout.

Another perfectly beautiful flower of this same class and which we owe to Mr. P. D. Williams, is *Mitylene*. The plant is entirely hardy, prolific of bloom and the whole bloom is of cardboard-like substance. The perianth is pure white, overlapping and of amazing quality; the crown a delicate pale primrose color, fading to cream. It is of one of the best beloved treasures in my garden.

Tunis (Will., P. D. 1927), as we grow it at Rhodeen, is a perfectly stunning garden plant. Some people claim that it is not so vigorous with them but here we find it is most happy, when given light shade. Under the protecting branches of nearby trees, the flower opens creamy-white with a pale lemon crown. But after several days, passes to milk-white with a frill of coppery gold at the edge. If the weather is propitious, it is not uncommon for the blooms to remain in fine form for from ten days to two weeks.

The newest and best acquisitions among short-cupped Leedsii are *Pucelle* (Engle., 1930) and *Nelly* (Will., P. D. 1927). The former is a most distinct and beautiful hybrid with narrow flat pure white perianth and a medium-sized goblet-crown. The flower is tall and striking, a chaste pure white throughout.

Nelly, a plant of very different type, is sometimes called a White St. Egwin. It has immense height with flowers of grand quality which are said to measure 4 inches across. We failed to measure ours but the broad overlapping perianth is purest white with a small lemon tinted crown, showing sometimes a touch of salmony-orange in the rim.

But one might continue indefinitely, telling of experiences with these lovely creations of the modern hybridist. But space is limited and it is possibly well to pause with the Leedsii group. For there are always beautiful additions being made in this class, and we may feel perfectly sure of having even finer things to report at some later time.

Artificial Reversal of Growth Dominance in Amaryllids

HAMILTON P. TRAUB, *Florida*

In connection with the working out of a technic for amaryllid¹ breeding with flowers on excised scapes, an interesting case of the artificial reversal of growth dominance has been observed.

In a large number of trials, self or cross pollinated flowers of excised amaryllid scapes, especially those of *Hippeastrum*, placed in water or a nutrient solution, have in the great majority of cases produced seeds. Within limits, the number of seeds produced per capsule seems to be largely a function of the relative size ("fleshiness") of the peduncle. Species in five Genera have been used in the experiments,—*Hippeastrum*, *Crinum*, *Haemanthus*, *Zephyranthes* and *Narcissus*. In *Zephyranthes* the number of seeds produced has been below expectancy, especially in the case of *Z. Atamasco* and *Z. treatiaeae*, which may be due in part to the relatively small size of the peduncle. *Z. robusta*, with a larger peduncle, produces a relatively larger number of seeds per capsule. Although abundant seeds have been secured from excised scapes of *Crinum asiaticum*, *C. longifolium album* and *C. longifolium roseum*, only an abundant number of fleshy fruits without seeds were produced in the case of *C. augustum*, a doubtful species which does not set seeds under Florida conditions. A Burbank hybrid *Crinum* produced many small seeds in each pod which were not viable. Approximately 5 percent of flowers on excised scapes of *Haemanthus multiflorus* have produced seeds.

¹The term "amaryllid" as used here refers to any species under any Genus of the Amaryllidaceae, Order Amaryllidales, according to Hutchinson, "Families of Flowering Plants, Vol. II, Monocotyledons". London. Macmillan. 1934.

The behavior of *Narcissus tazetta*, The Pearl, under Florida conditions, led to the experiments reported below. This variety does not set seeds under Orange County, Florida, conditions, but it was noticed that when excised flower scapes fell to the ground, in the partial shade of the rows of narcissi, in due course, seed capsules were matured containing a few seeds. This suggested the hypothesis that growth dominance for this variety of *Narcissus tazetta* is normally confined to the lateral growth at the base of the flower scape (2)² after flowering in central Florida and that growth dominance in excised scapes can be reversed in favor of the developing ovary under favorable conditions.

To test this hypothesis further an experiment was carried out with excised scapes of *Hippeastrum equestre major* in water with flowers pollinated. The controls consisted of excised scapes in water with flowers not pollinated and unexcised scapes with flowers pollinated. This variety of *H. equestre* propagates very rapidly by offsets under Florida conditions but normally does not set seeds.(3) Six flowers were self pollinated; the same number were crossed with pollen from a named hybrid variety. In the first case 66 2-3 percent and in the second, 100 per cent of the flowers produced seeds. The ovaries on the scapes used as controls dried up soon after the flowers faded. The ovaries on the excised scapes in water where pollen was applied increased to normal size even when no seeds were produced. The number of seeds was low, usually only one or two seeds in the upper end of each of the three locules. The results indicate that part of the failure to produce seeds in this variety under Florida conditions may be due to self-incompatibility but another important factor is apparently to be found in the growth dominance of the rapidly forming offsets, or the new lateral growth at the base of the declining flower scape.(2)

Although these results clearly indicate that growth dominance may be artificially reversed in favor of the apical stem (peduncle, and ovaries at its periphery) they do not give direct evidence as to the causal mechanism responsible for the reversal. The variety *H. equestre major* is native to tropical America and its failure to set seeds in Florida may be due to the fact that it flowers from February to April inclusive, during the latter part of the dry season in the State. The *Narcissus* variety, The Pearl, also flowers during the winter. A hormone mechanism (5,1) on the basis of growth promoting and growth inhibiting substances (4) might be postulated to account for the facts but no experiments with this in mind have been carried out. This plant material may be of value in such studies.

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Experiences in Breeding Crinums

CECIL HOUDYSHEL, *California*

Before arriving in California thirty years ago we had possessed a few *Hippeastrum johnsonii* and *Crinum moorei* bulbs. It was our ambition to grow and breed bulbous plants especially of the Amaryllis Family here. Since it was necessary to earn a living we followed our profession of teaching for the following nineteen years and the bulb interests were perforce reduced to the rank of a hobby. But later they became a "side line." Finally the origination of the gladiolus *Los Angeles* enabled us to devote our entire time to bulb growing and originating.

²Reference is made by number (italic) to "Literature Cited" at the end of the article.

By 1913 we had accumulated a small collection of crinums and began breeding them. We found *C. longifolium* so hardy and so profuse in the production of seeds that for one season we fertilized all its flowers with pollen from *C. moorei*. From this cross we raised approximately 600 seedlings. This is the same cross as *C. powellii alba* and *rosea*, though it is probable that the seed parent of *powellii alba* is *C. longifolium album* and of *C. powellii rosea* is *longifolium roseum*. As we had few if any *C. longifolium album* at that time we probably used the variety "roseum" as the seed parents. We are not sure as no notation was made. Our results were a series of seedlings of close resemblance but different in flowers from "Powellii." Not one had a white flower, nor one that much resembled the pale pink variety "roseum."

Several of these new seedlings were a deep pink in color. Most of them were profuse bloomers, more profuse even than its seed parent. The one selected for introducing had the deepest pink flower and is a perpetual bloomer except in very cold (California) weather. This one we named *Cecil Houdysbel*.

The foliage and bulb of this crinum, and of all seedlings in the series, are the same as the "Powellii" hybrids. In fact it is safe to predict that this cross will always produce hybrids of nearly identical appearance when not in flower.

Of the original 600 seedlings, besides *Cecil Houdysbel*, we still have four other varieties. They are probably too nearly like the named variety to warrant introduction, though one is still being considered.

The ability of this variety to bloom in cool weather has made it quite popular in Florida as a winter bloomer. For the same reason it should be very useful in the north and for growing in conservatories and in the house. Both parents are relatively hardy. Indeed *C. longifolium* has wintered outdoors with some protection in the North. We are told that *Cecil Houdysbel* is hardy in South Carolina and we believe, if planted deeply and protected by a mound of earth, leaves and brush, it should survive the winters much farther north. We hope this may be tried and results reported.

The fact that crinum hybrids are usually infertile or nearly so is partly the reason that little advancement has been made beyond the species. Even the species, except *C. longifolium* and *C. moorei*, set almost no seed for us. It has been said that *C. moorei* may be a hybrid and the great variability of its seedlings might seem to indicate that, but its great productivity in seed bearing, in our opinion, conclusively proves it a species.

We were surprised and pleased to find that our hybrid bore quite a few seeds by self pollination. Several of these seed were planted. The seedlings so produced have shown little variation from the parent. We were able to obtain a cross with pollen from another hybrid, *J. C. Harvey*, and raised one plant introduced last year under the name, *Virginia Lee*.

The hybrid, *J. C. Harvey*, is the offspring of *C. moorei* pollenized by *C. kirkii*. In our experience, crinum hybrids usually resemble the seed parent more than the pollen parent in foliage and general appearance. *J. C. Harvey* thus has a greater resemblance to *C. moorei* than to *C. kirkii*. *Virginia Lee* departs from our experience in this as the general appearance of the plant is very much like *J. C. Harvey*, its pollen parent. This is probably due to the influence of *C. moorei* in both sides of its ancestry.

With us, *J. C. Harvey* is a rather shy bloomer. It has a pretty pink flower smaller than *Cecil Houdysbel*. *Virginia Lee* is free flowering and has an extended season but begins to bloom later than *Cecil Houdysbel*. Last winter, being very mild, we had flowers from it until mid-winter. With less than fifty bulbs in existence and less than ten years old, we do not yet know all about it. It has been moved and divided twice, the last time very recently. It seems to prefer semi-shade, but we are trying out a few in nearly full sun.

The flowers of *Virginia Lee* are bright pink with a light throat. They show the *C. moorei* influence but are larger and wider open.

This variety bears seed quite freely and hybridizes readily. Probably no other hybrid approaches it in this respect. We have already grown a number of seedlings from it but so far none have bloomed. They vary somewhat in form.

We were very much pleased to receive a letter from one of the best judges of amaryllids, (an official of this Society) stating that he considered *Virginia Lee* the most beautiful crinum hybrid so far produced.

Our experiences in plant breeding have included gladioli, iris, hippeastrums, amaryllis and other genera. We have sometimes found it advisable to work up a strain that bears seed profusely as a preliminary to development. We believe the introduction of *Virginia Lee*, having three species in its ancestry and possessing a high degree of fertility, considerably enlarges the opportunity for plant breeders to improve *crinums*.

Although we have introduced but two *crinums*, that is not the sum of our efforts to obtain new and worthy varieties. Many hundreds have been rejected. We are at present trying out more than twenty-five. We have a few *C. pedunculatum* (very similar to *C. asiaticum*) crosses. These are large plants like the seed parent but the flowers have wide petals. Since we can grow as nice and as large a flower on the smaller crinum bulbs, it is likely to be "thumbs down" for them.

We have raised many seedlings of *C. moorei*, self fertilized. The flowers range from almost pure white to deep pink usually with a light throat. One of these seedlings, which we have not been able to locate recently and is now probably lost, had wider petals and was entitled to be called, "variety *platypetala*." We have another that has two or more times as many flowers in the umbel and seems to be entitled to the varietal name, "*flore pleno*." Albinos with pure white leaves frequently appear among seedlings. A lot of recent seedlings have over 10% albinos. Lacking in chlorophyll they usually die after using the food stored in the seed. This tendency to albinism has sometimes resulted in plants with foliage striped white but they too are weak. We had one for years but it never multiplied or flowered and finally died. *C. moorei* also varies somewhat in the shape of the bulb. This seems to be the only variable crinum species and hence is most useful to the breeder.

Crinum development has scarcely passed the desultory stage except that our own efforts in recent years have been rather systematic we think. So far as we know *Virginia Lee* is the first second-generation hybrid and the first to show more than two species in its ancestry. No one knows the possibilities of future development. So far crinums have developed comparatively little beyond the forms produced by nature. Compare the modern hybrid hippeastrums with the wild species. We have bred them for twenty-five years and have at least a nucleus of bulbs left from the thousands we have grown that have wide rounded petals, pure self colors and variations with color tones never seen in the wild species. We have even raised a few having absolutely no green in the center. The combined work of many breeders has produced a race of hybrid hippeastrums to which the wild species cannot be compared. Compare also the modern pansy, the modern gladiolus and iris with their prototypes and a vision is gained about the possibilities of crinum development.

We believe the greater possibilities for producing distinct breaks in the tenacious racial characters of the crinum lies in the use of *Virginia Lee* as a seed parent. To other breeders we do not mind revealing that we shall use pollen from the best hybrids available and favoring perhaps those having *C. moorei* as an ancestor. It is important in order to increase the tendency to "break" or vary considerably from other crinums to bring as many genera as possible into the race of hybrids. If this article, written in the spare moments from arduous labor and in one (nearly) all-night session shall increase the interest of flower lovers in crinums or inspire others to help in their breeding and development we shall be well repaid. Most any amateur breeder might raise the finest new hybrid.

Extensive experiments will bring the greatest results. The plant breeder needs customers. This may likely result from improvement and the dissemination of formation by this Society. We wish to emphasize a fact noted in last year's Amaryllis Year Book. Although crinums are tropical and semi-tropical bulbs, so also are gladiolus, dahlias and some other summer bulbs grown in the North. At present few crinums are found in the gardens of the temperate zone. This is an unnecessary restriction for crinums can be handled much the same as gladiolus or dahlias. When stored the large roots should be preserved and well covered with dry earth or sand. We have often kept crinum bulbs out of the ground for years. A bulb so stored for a couple of years will often bloom at once when planted. Some species (notably *C. longifolium* and *C. moorei*) are far more hardy than is generally supposed. Some have been left out doors all winter as far north as Missouri. They must be protected from freezing by a mound of earth, leaves and brush.



C. G. van Tubergen, Ltd.

Amaryllis belladonna parkeri var. zwanenburg

See page 114 for description.



C. G. van Tubergen, Ltd.

Pamianthe peruviana

Belladonna Lily Hybrids and Pamianthe Peruviana¹

TH. M. HOOG, *Holland*

"For many years we have tried to improve *Amaryllis belladonna* and what we have obtained is shown by the enclosed photograph. *Amaryllis belladonna* was crossed with *Brunsvigia josephinae* and *B. gigantea* and this produced *Amaryllis belladonna parkeri*, which is a tall "Belladonna" with a large number (up to 20) of flowers. Alas, owing to *Brunsvigia*, it will only grow and flower well in a climate which has a very hot summer and autumn, like the south of France, Italy or Spain. As we have in Holland a variety of *A. belladonna* (*var. purpurea major*) which even in our cold climate always blooms regularly and, if well established, with several spikes, we obtained seeds from this by hybridization with the said *A. belladonna parkeri* and this resulted in a strain of free blooming "Belladonnas" with numerous and large flowers of a very beautiful coloring, deep pink and white with yellowish throat, on strong stems. (See illustration on page 113).

There are as you know in September and October very few or no bulbous plants in flower with long stems and large beautifully colored blooms, which are of long endurance. Here is one of great beauty.

We also beg to enclose a photograph of a new amaryllid, *Pamianthe peruviana*, a new genus, midway between the central and southern American genus, *Hymenocallis*, and the old world *Pancratium*. This is flowering here for the first time. It is very beautiful, distinct and easily grown in a temperate house."

¹Excerpts from a letter by Mr. Th. M. Hoog, C. G. Van Tubergen, Ltd. Haarlem, Holland, Dec. 28, 1934.

4. Propagation

Vegetative Propagation of Hippeastrums

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In 1926 an initial account was given of the propagation of *Hippeastrum* by vegetative means. The experiments published at that time, have been followed up by several series of researches, such as those to determine: the optimum temperature at which the scales must be kept, in order to insure regeneration; the best way to harvest the young bulbs; the width of tissue on the scales, showing power of regeneration; the age of bulbs to use for scooping; the most favorable season for scooping *Hippeastrum* bulbs; relative advantages of cutting and scooping methods.

It is sincerely hoped, that this short account of these various experiments may be found helpful, when applying this method of propagation. As a result of these experiments it ought now to be possible to obtain with certainty, large quantities of pure stock from *any Hippeastrum* bulb by the scooping method. The importance of this method will not only be found in the fact, that the fixation and preservation of fine hybrid specimen can be insured by the vegetative propagation of the original bulb, but they can now also be produced in *commercial quantities* by the same means and *sold true to name*. Moreover, I have found that the percentage of flowers produced is directly influenced by the temperature. In order to obtain exact data as to this influence of the temperature and the proper treatment of the bulbs, it is necessary to experiment with the bulbs, which are as nearly as possible alike in age and kind, and consequently this means of propagation is also of the greatest importance for the entire culture of *Hippeastrum*.

Before giving the results of my latest experiments, I wish to describe the method of scooping once again, for it has come to my attention that difficulties are often encountered, through not being sufficiently acquainted with the details of this method.

If the bulb has any foliage, this should first be cut off. The next step is to remove the basal plate of the bulb by means of a scooping knife (Fig. 1): the scooping operation. This name is due to the resulting hollow found in the bulb, when the basal plate is removed in this fashion (see Fig. 2). The cutting surface of the scooping knife should be kept parallel and as close as possible to the spherical surface of the bulb-base (basal-plate).

The correct scooping stroke can be quickly acquired through practise. It should be executed with a single quick cut of the scooping knife, which has a thin, bent blade, which should always be kept well sharpened. The model of knife used can be seen in Figs. 2, 3 & 4, where it can be seen lying on the table. This scooping knife can be purchased from Heenk, Groote Houtstraat 99, Haarlem, Model Van der Laan, left- and right-handed models are obtainable; Fl. 0.70. The use of an ordinary pocket knife must be strongly disadvised.

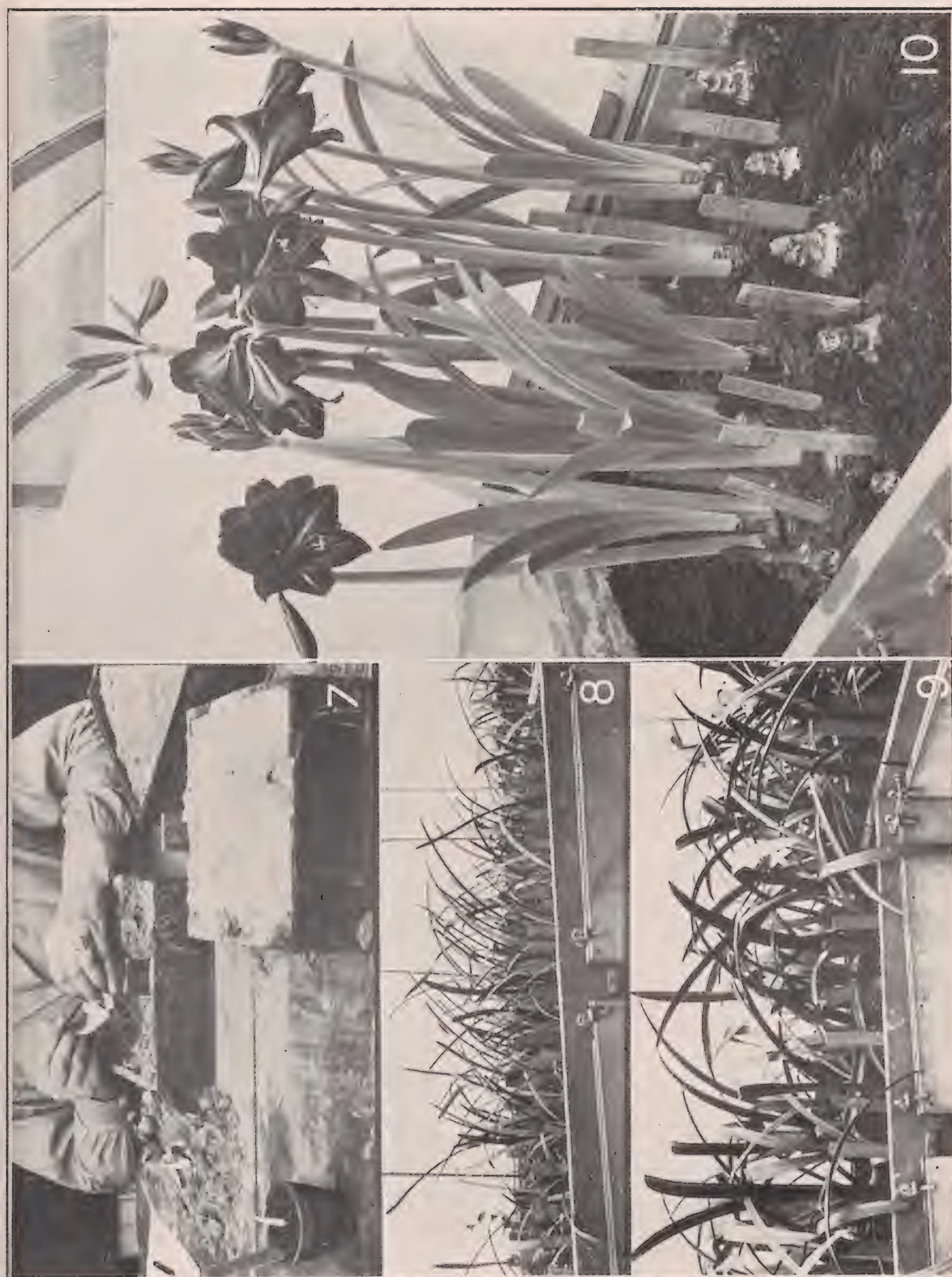
The next step is to cut the bulb lengthwise in half, parallel to the surface of the foliage leaves (Fig. 2). It is advisable to use a fairly large knife to do this, in order to insure making a clean cut.

Starting from the centre of the bulb the scales are then removed (Fig. 3). If any scale should not separate or come loose easily, a little more of the base of the bulb, to which they were attached, may be cut with the scooping knife. Small parts of the base which have in this way been removed, can be seen lying on the table, next to the scooped bulb in Fig. 2.

The separate scales are then placed in a *slightly slanting position with their hollow side down* in a flat or earthenware seed pan, about $\frac{3}{4}$ -filled with moist fine sand. When the flat is filled, they are then covered to the brim of the container with more moist fine sand (Fig. 4). The slightly slanting position gives the advantage that the



Figs 1 to 6, incl., showing method of procedure.



Figs 7 to 10, incl., showing method of procedure and results.

scales can be completely covered. Only the upper ends of exceptionally long scales protrude out of the surface of the sand.

Several experiments were made with scales placed in horizontal position, with their hollow side up and with their hollow side down, all in moist sand. Both methods disclosed certain disadvantages, as compared with the slightly slanting position finally adopted. When placed with the hollow side up, moisture gathered in the hollow cup of the scale, causing decay. When on the other hand, the hollow side was faced downward, the development of the young bulblets was seriously impaired, reducing their growth or producing deformation.

The narrow foliage leaves found in the centre of the mother bulb and the flower buds, can be discarded since they produce no new bulblets. The base of the bulb should however be potted up in fertile soil immediately (Fig. 4) and the pot buried in the ground of a greenhouse at 25-28°C. On this base 1 to 3 bulblets will usually develop. In Fig. 1 we see that the roots of the bulb which is in the process of being scooped, have been cut off. Later experiments have shown that this is not desirable. The scooped base should be planted *with* its roots.

The flats and pans should now be placed at a constant temperature of 30°C. in the light or in the dark. They can be kept in a room, thermostat, propagating case or brooders and electric hotbeds (Wyman and Nixon, 1934) at the prescribed constant temperature. If kept out of doors, care should be taken so as not to place them in direct sunlight. In my own case, I have preferred to place them in a room which was kept at a constant temperature of 30°C. I placed the flats and pans in a kind of open frame covered with a pane of glass, so that they were kept in a moist, well ventilated atmosphere. The glass pane had the advantage of enabling me to inspect the condition of the flats at a glance.

The sand must be kept constantly moist. Every other day the flats were sprayed with a fine nozzle. The sand in the flats may not become too wet and on the other hand when too dry, the scales are apt to dry out and thus lose their regenerating powers. The flats should therefore be kept moist and yet not too wet.

Every 3 to 4½ weeks the flats should be thoroughly inspected. The first inspection after scooping has no other purpose than that of enabling one to remove small parts of the scales which may show a beginning of decay, and also to investigate the conditions of moisture in each of the flats. At that time of course, there can be no question of harvesting any new crop, since no signs of regeneration can as yet be detected.

After the first 2 months, we can see the first tiny bulblets formed on the scales (Fig. 4). Exceptionally, one or two of these bulblets can already be detached from their scale, but it will usually be found necessary to wait 3 months before the first bulblets can be harvested (Fig. 6).

With a small sharp blade the bulblets are then cut loose from the mother scale, being careful to see that the smallest possible part of the old scale remains attached to the young bulblet (Fig. 7).

Weak bulblets remain attached to their mother scale and are returned to their respective flats of moist sand. Bulblets showing leaflets should always be harvested, although in the case of strong and healthy bulblets, it is not necessary to wait for the development of a foliage leaf before detaching them from their scale. Some bulblets will be found to have developed a root. If the instructions are correctly followed, the old scales will present a healthy aspect throughout many long months. Some indeed, will last a whole year ere they begin to show signs of decay.

The new bulbs should now be planted in fertile soil (Fig. 7) and until they have become sufficiently strong, they should be kept in a hothouse under glass at a ground temperature of 25°-28°C and an air temperature of 25°-26°C.

One year after scooping they will present an appearance as shown in Fig. 8 and again one year later as in Fig. 9, whereas Fig. 10 shows the flowering of a pure strain, regenerated from one single bulb.

The Temperature Required for Regeneration

That a fairly *high* temperature—next to sufficient moisture—is to be considered as a first requirement for regeneration, was already discovered when scooping *Hippeastrum* bulbs in 1922 (published 1926). It will be remembered, that in those experiments 27°C gave better results than 20° and 23°C. In 1924 bulbs which had been

scooped on December 4th, 1923 *produced more good bulblets at 30°C, than at 24° and 27°C.* In those experiments 3 series of scales, of 8 bulbs each, were kept at those 3 different temperatures, in a mixture of moist peat-moss and sand, until Oct. 21st. Those having been subjected to 30°C produced far more, i. e. 168 bulblets (averaging 22 to a bulb), whereas those at 27°C. produced 61 bulblets (averaging 8 to a bulb) and those at 24°C. 108 bulblets (averaging 13 to a bulb). The fact that fewer bulblets were produced at 27°C. than at 24°C., is due to the inactivity of four bulbs in the former lot. The percentage of bulblets produced in this experiment, would probably have been higher had pure fine sand been used instead of the mixture of sand and peat-moss, because such a mixture is liable to become mouldy very soon. Investigation will now be made to find out if perhaps temperatures higher than 30°C. will produce even better results.

Best Method of Harvesting the Young Bulblets

From Nov. 26th, 1924 until Oct. 1925 an experiment was made to determine whether, instead of lifting the scales every 3 to 4 weeks and repotting them, as was done in 1923, it might be better to leave them as they were, harvesting and potting up the young crop formed, only in June and at the end of the period, in October.

The substratum used in this case was fine moist sand, kept at a temperature of 30°C. and covered with a pane of glass in such a way, that the flats had ample ventilation and so that a sufficient amount of air could reach the sand and the scales. Since these flats were kept in a greenhouse, the young shoots formed could assimilate as soon as they appeared above the surface of the sand. A total of 18 bulbs were scooped, but on the whole the result was very much less satisfactory than by the old method used in 1924. In that year an average of 22 bulblets was obtained at the same temperature of 30°C. (This average was 16 in 1926 and 38 in 1927), but in this year (1925) the average number of bulblets obtained was only 10, and even so these bulblets were exceedingly poor in quality and for the greatest part, they showed red spots of decay on their surface. Many perished after harvesting, thus reducing the average obtained to about five. Many bulblets could not even be potted, since at the time of harvesting, their centre was found to be completely decayed, the outer scale only remaining. Such bulblets it was found, had grown in unfavorable surroundings, such as the neighbourhood of old scales in the process of decomposition, which infected the young bulbs and hampered their growth. (If inspected every 3-4 weeks, this could never have happened, since the decaying tissues of the old scales are then systematically removed). Moreover, if the bulblets are potted up as soon as they are large enough to be cut loose from the mother scale, (as is the practice at the 3-4 weekly inspections), they reach a fertile soil while still in a perfectly healthy condition which causes them to grow much faster. And finally,—regardless of the fact that decay reduces the crop—fewer bulblets are formed on each scale when they are allowed to remain too long on the mother-scale, for they then draw most of their nourishment from this scale and cause the latter to age more quickly and dry out, whereas on the other hand, as soon as a bulblet is cut loose from the mother scale, the latter will continue to form new bulblets to a much greater extent.

To summarise the results of this experiment, it may be said that the method of “leaving the bulblets on the scales” cannot be recommended.

Size and Age of the Bulbs

The size of the bulb which is to be scooped for regeneration purposes, is dependent on its age and is also a factor of importance governing the production. Next to the number of bulblets produced from each bulb, the age and the weight of the scooped bulb can be found in Table 1. By means of this table the relative production of different groups may be compared at a glance. Thus from bulbs aged 1 yr, 5 mths, an average of 1.8 bulblets may be expected; from those aged 2 yrs, 5 mths, an average of 7 and from those aged 3 yrs, 5 mths, an average of 15.1 bulblets can be looked for, provided other conditions of growth are equal. Thus it is evident, that older bulbs are better stock for reproduction by means of scooping than the younger ones. If the largest number of bulbs attainable from a certain specimen is desired in the shortest possible period, the first lot of bulblets obtained, may themselves be scooped as soon as they weigh 75-100 Grms. In order to figure out the number of

regenerated bulbs in such a case, the number of bulbs scooped may be multiplied by 7. If it were possible to wait another year however, this harvest of young stock could be doubled.

TABLE I.

Age of bulb scooped	Weight in Grms	Harvest	Age of bulb scooped	Weight in Grms	Harvest	Age of bulb scooped	Weight in Grms	Harvest
Yrs.Mos.			Yrs.Mos.			Yrs.Mos.		
1 5	24	2	2 5	106	8	3 5	221	16
1 5	23	2	2 5	75	5	3 5	223	25
1 5	15	2	2 5	62	8	3 5	177	9
1 5	10	—	2 5	76	8	3 5	176	23
1 5	12	3	2 5	67	10	3 5	169	9
1 5	19	3	2 5	69	9	3 5	168	2
1 5	13	1	2 5	81	1	3 5	326	22
Average: 1.8 bulblets per bulb.			7 bulblets per bulb			15.1 bulblets per bulb		

The Method of Cutting

Apart from scooping, the bulbs may also be cut in other ways. In the year 1927 I took six bulbs, which had been obtained from seed sown in 1923, and weighing 230, 150, 150, 178, 175 & 150 Grms, respectively. I gave each of these bulbs three perpendicular and transversal cuts, reaching from the top to the base of the bulb. Three of these bulbs were placed in moist sand at 30°C. and the three others in fertilized soil in the greenhouse at a temperature of 24°C. In both experiments the three bulbs produced an equal number of 7 bulblets. Although these bulbs were much larger than the bulblets obtainable through scooping (in the same period), I would rather prefer the scooping method, because of the greater number of bulbs obtained. *Traub* (1933, 1934) obtained 43 bulblets from 10 bulbs by this method of transversal cutting into quarters, which is also a relatively small number. The results he will secure when bulbs are cut into 96 pieces as reported are awaited with interest. *Heaton* (1934) used another method of cutting. His method was to cut up a large bulb (including the base), into as many as 48 little pieces. He claims that, given proper treatment, each little piece will produce a bulblet. He also cites a case where a bulb cut into 36 pieces, produced 18 bulblets. *Heaton* selects bulbs which easily form offsets, in order to obtain quick propagation. However, although the results obtained by this method would seem favorable to a quick propagation, I would rather advise using the scooping method as described above, especially in those cases when one has to work with material, of which the powers of vegetative regeneration are as yet unknown. My reason for this advise is that by applying the scooping method, the base of the bulb is removed in such a way, that the base of each scale is cut, that is to say the very region in each scale, where young bulblets are easily and rapidly formed. Experience has shown that such a procedure encourages the formation of bulblets to a higher degree than when the scales remain attached to the base.

In relation to this I may also mention, that I have made experiments to determine the height of the meristematic zone. For this purpose I took 4 bulbs and divided each of these into four equal parts by means of perpendicular cuts through the axes of the bulbs. One quarter of each bulb was then scooped in the normal fashion (i.e. close to the base), $\frac{1}{4}$ was scooped 0.5 cm from the base, another $\frac{1}{4}$ at 1½ cm and the last $\frac{1}{4}$ at 2½ cm from the base. The result was, that only the four quarters which had been scooped in the normal fashion produced any bulblets. This proves, that above 0.5 cm from the base no regeneration may be expected.

In a previous experiment (1926) I had found, that when cutting 0.3 cm from the base young bulblets could still be formed on the scales. The extreme limit of the meristematic tissue must therefore lie somewhere between 0.5 cm and 0.3 cm from the base.

TABLE 2
Total Number of Bulblets Harvested Until this Date from Bulbs Scooped
in Various Months.

Bulb			Date of Scooping	Total Number of Bulblets Harvested Until this Date from Bulbs Scooped in Various Months.																			Number of months elapsing between scooping and har- vesting of the first bulblet.	Number of bulblets harvested to each bulb.
Weight in Grms.	Circum- ference	5-20 1930		6-20	7-17	8-20	9-22	10-20	11-23	12-29	1-15 1931	2-20	3-23	4-29	5-22	6-25	7-17	8-24	9-22	10-26				
1 151	22.8	(Dec. 19th)	1 1930	1	5	5	6	7													7	6		
2 199.5	25.5	(1929)		2	5	7	8															8	6	
3 125	22.0	(Jan. 20th)	1 1930	2	5	6	8														8	4		
4 243	27.6	(1930)		2	4	5	6															8	4	
5 172	25.4	(Febr. 20th)			1	2	3	4	10												4	7		
6 113.5	21.8	(1930)					9	9														10	5	
7 163.5	24.0	(March 21st)			1	2	6	7	13												13	4		
8 101.5	21.6	(1930)					2	2	3													3	6	
9 107	19.7	(April 22nd)			1	2	4	1	7	21	23	24	24	24	25						7	6		
10 201	25.8	(1930)						12	16	20	20	23	26	26	30							25	3	
11 117	23.1	(May 20th)				1	3	9	18	20	23	27	29										3	
12 222	26.9	(1930)				3	4	8	15	18	22	27	29										3	
13 163	23.5	(June 20th)					1	3	9	10	14	19	21										4	
14 233	25.1	(1930)						2	5	10	13	17											4	
15 163	22.5	(July 18th)							5	14	22	27	28	31	32								4	
16 225	25.7	(1930)						1	2	9	15	22	27	28	29	30							3	
17 126.5	19.5	(Aug. 20th)							2	3	4	11	15	16									5	
18 222	24.3	(1930)									8	9	13	24	27	28							4	
19 340	30.0	(Sept. 22nd)							1	1	5	11	17	18	26	27	33	33	42				3	
20 397	31.3	(1930)								1	2	12	17	29	32	37	38	41					3	
20 257	26.3	(Oct. 21st)							1	1	4	6	8	10	14	15							2	
22 196	24.5	(1930)												3	8	8	8	9					6	
23 240	26.6	(Nov. 25th)											1	3	3	7	11	14	15				5	
24 145	21.5	(1930)												2	3	7	14	17	18				5	

In order to fix the boundary of the meristematic zone more exactly, it will be necessary to determine anatomically—by counting the rows of cells—how many of such rows can take an active part in the regenerative process. For the present it will be sufficient to note, that the more carefully the base of the bulb is cut away (by scooping), i. e. the closer one cuts to the actual surface of the base, or in other words the more tissue which is left on the scales after scooping, the better chance one will have to obtain good results from this method.

The Season of the Year in which the scooping operation is performed, is also of great importance. Until the year 1929 I have always scooped at the end of November or beginning of December, but experiments undertaken in 1929/30 showed clearly that the season in which this scooping was done, also had great influence on the number of bulblets formed on the scales.

At the end of 1929, 24 bulbs of equal weight and all belonging to the same pure strain (i. e. propagated of one single scooped bulb—15/X11/25) were selected. The idea was, that every month during a whole year, 2 of these bulbs should be treated by scooping. A start was made on Dec. 19th, '29. In order that they should have their usual resting period, the remainder of these 24 bulbs were kept (from Oct. 18th. on) at a temperature of 23°C. Later on and as soon as flower buds showed up, they were moved successively to our greenhouse. Until March 22nd however, the bulbs to be scooped (according to our schedule of 2 a month) were taken from the batch that were still kept at 23°C., i. e. which had no foliage leaves. At the end of March all the remainder had been moved out to the greenhouse and been planted. After Sept. 1st. no more water was given. On Oct. 1st, the foliage was removed and at the end of Oct. they were again brought at a temperature of 23°C.

In table No. 2 the dates of scooping and the harvest obtained in each case may be studied in detail. From the total number of bulblets formed (recorded in the next to last column) it is evident that the bulbs numbered 11 to 20 gave the highest production. *These bulbs were those scooped in the months of May, June, July, Aug. & Sept.* We conclude from this, that bulbs which have had a period of active growth and which have had the benefit of assimilating freely, produce conditions more favorable to regeneration. This favorable condition even continues for a certain time *after* the bulbs have been set dry, for after Sept. 1st no more water was applied to them. The next month (Oct. 21st) the number of bulblets formed, again decreases. Note also, that the period of time elapsing between scooping and that of potting up the first bulblet is *shortest* in the period from May until September.

Summary

Good results will be assured if scooping is performed as described above, i. e. starting with good-size bulbs and scooping in the months of May to September. The scales should then be kept at a constant temperature of 30°C. and in moist sand, being careful to protect the flats against loss of moisture by covering them with a pane of glass, or by placing them in a shady place out-of-doors.

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Propagation of Amaryllids by Stem Cuttage

HAMILTON P. TRAUB, *Florida*

Preliminary reports by the writer on the propagation of amaryllids by stem cuttage appeared in 1933 and 1934 (4, 5,¹). The present report is the final one in this series concerning hybrid *Hippeastrum* mainly and to a lesser extent the Genera *Haemanthus*, *Crinum*, *Hymenocallis*, *Narcissus* and *Crinodonna*. The results are so conclusive that future work need be concerned mainly with minor details of procedure.

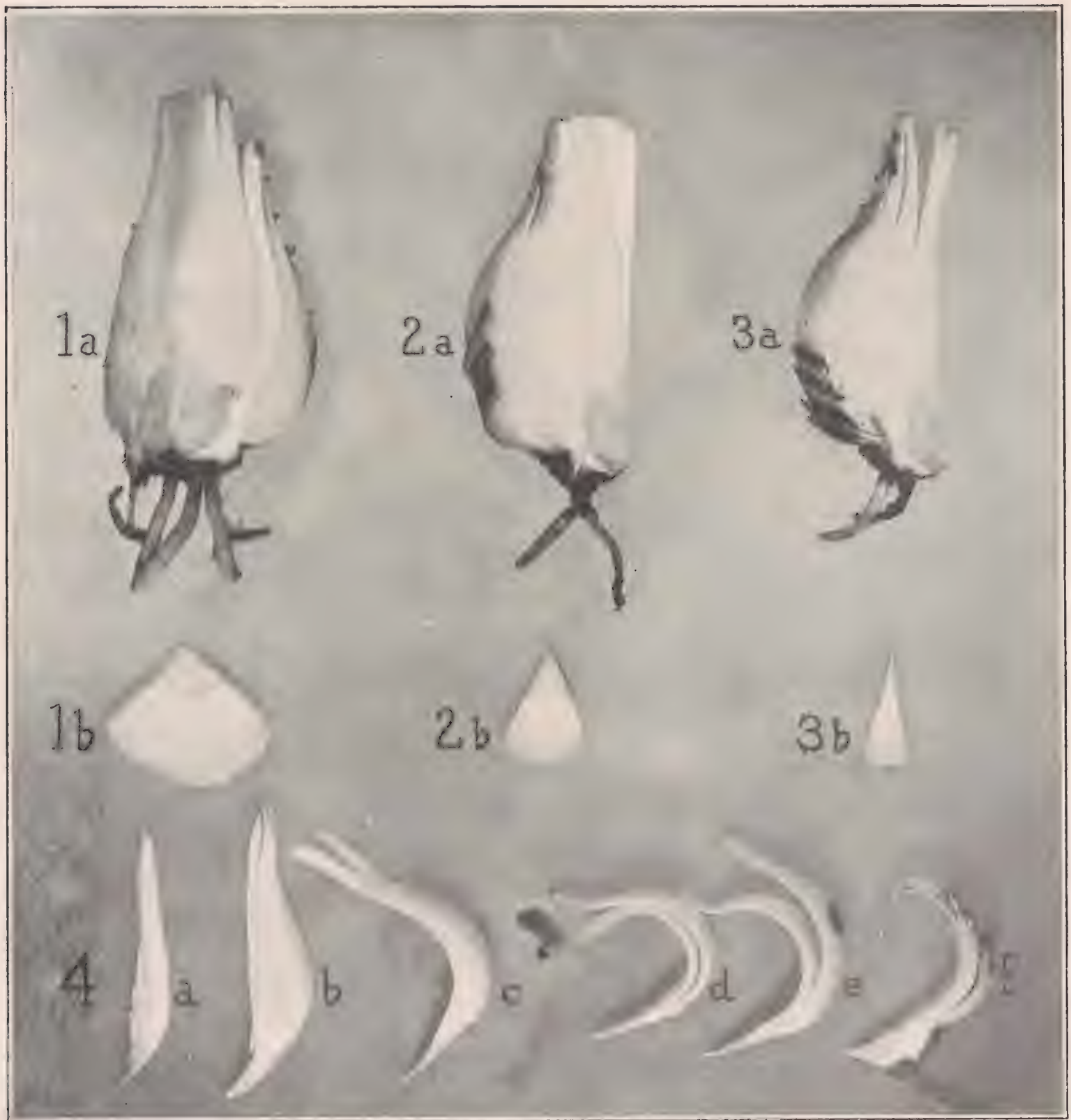


Fig. 1. Showing procedure for stem cuttage method,—1a, 2a, and 3a show $\frac{1}{4}$, $\frac{1}{8}$ and $\frac{1}{16}$ bulb fractions (vertical cuttage); 1b, 2b, and 3b represent cross sections of the above to show anatomical structure; 4a,-b,-c,-d,-e, and -f show the six fractions cut from a $\frac{1}{16}$ fraction, similar to 3a, by horizontal cuttage.

The method of stem cuttage differs markedly from the method of leaf scale incubation reported by Miss Ida Luyten in 1926 (3). In stem cuttage the bulb is cut into sections vertically which in turn are further sectioned horizontally. The final fractions are planted in a propagation medium and placed in half shade. In

¹Reference is made by number (*italic*) to Literature Cited at the end of the article.

TABLE 1. Propagation of Hybrid Hippeastrum by stem cuttage; experiment started Nov. 1933. (For data from Nov. 12 to Dec. 15, 1933 see pages 72-74 Year Book American Amaryllis Society, 1934).

		Stem Divisions		Stem Divisions. Number Sprouted 7-29-34							
Bulb No.	No. of Divs.	3-20-34 Number sprouted leaves above ground	No. sprouted with leaves above ground, 5-1-34.		From Lower stem part		From upper stem part		Total	Av. per bulb	Percent Sprouted 7-29-34
			From lower stem part	From upper stem part	Leaves above ground	Leaves not above ground	Leaves above ground	Leaves not above ground			
1	4	1	—	—	—	—	—	—	4 ⁽¹⁾	—	100
2	4	4	—	—	—	—	—	—	4 ⁽²⁾	—	100
1-2 incl.	8	5	—	—	8	0	0	0	8	4	100
3-E ⁽³⁾	32 ⁽⁴⁾	0	5	8	5	0	8	0	13	—	40.1
4-D	32	0	4	7	6	0	7	1	14	—	43.8
6-C	32	7	13	5	13	0	6	0	19	—	59.3
5-B	32	3	14	8	15 ⁽⁵⁾	0	10	0	25	—	78.1
7-A	32 ⁽⁴⁾	2	15	0	16	0	13	0	29	—	90.6
3-7 (incl.)	160	12	51	28	55	0	44	1	100	20	62.5
8-E	96	3	25	0	25	4	0	1	30	—	31.3
11-D	96 ⁽⁴⁾	0	13	0	17	22	0	0	39	—	40.6
10-C	96	0	24	0	24	20	0	0	44	—	45.8
9-B	96	0	29	0	29	21	0	3	53	—	55.2
12-A	96	21	57	10	59	2	10	0	71	—	74.0
8-12 (incl.)	480	24	148	10	154	69	10	4	237	47	49.4

⁽¹⁾ 5 bulblets counted as 4 stem divisions sprouted.

⁽²⁾ 6 bulblets counted as 4 stem divisions sprouted.

⁽³⁾ Arabic numerals refer to the order of arrangement in Table 2 on page 73, Vol. 1, Year Book American Amaryllis Society, 1933; letters following numerals refer to arrangement according to decreasing number of stem divisions sprouted per bulb, A-E.

⁽⁴⁾ Stem of bulb was relatively small in diameter.

⁽⁵⁾ One division produced 3 bulblets which are here considered as one single stem division sprouted.

Miss Luyten's method, the bulb scales with the small adhering portions of stem tissue after removal of the major portion of the stem, are placed in a propagation medium, and incubated at approximately 80°F. Since the last report a statement of Mr. Byrnes' method has appeared (1). It is described as a slow method "analogous to scooping of the hyacinth. In the process, however, he reams out the base inside the root ring and then pots the bulb and keeps it growing without cessation for two years, when the bulblets are potted off separately". Heaton reported results with a stem cuttage method in 1934 (2). The Luyten method and the stem cuttage method are superior to the "reaming" of Byrnes since results are secured in less than one year.

Materials and Methods. Bulbs of the Nehrling-Mead strain of hybrid *Hippeastrum* were used in these experiments. The bulbs were ordinary field run stock, 2½ inch grade, and were purchased from commercial growers. Bulbs of various species in the Genera *Haemanthus*, *Crinum*, *Hymenocallis*, *Narcissus* and *Crinodonna*, were from the writer's collection of amaryllids.

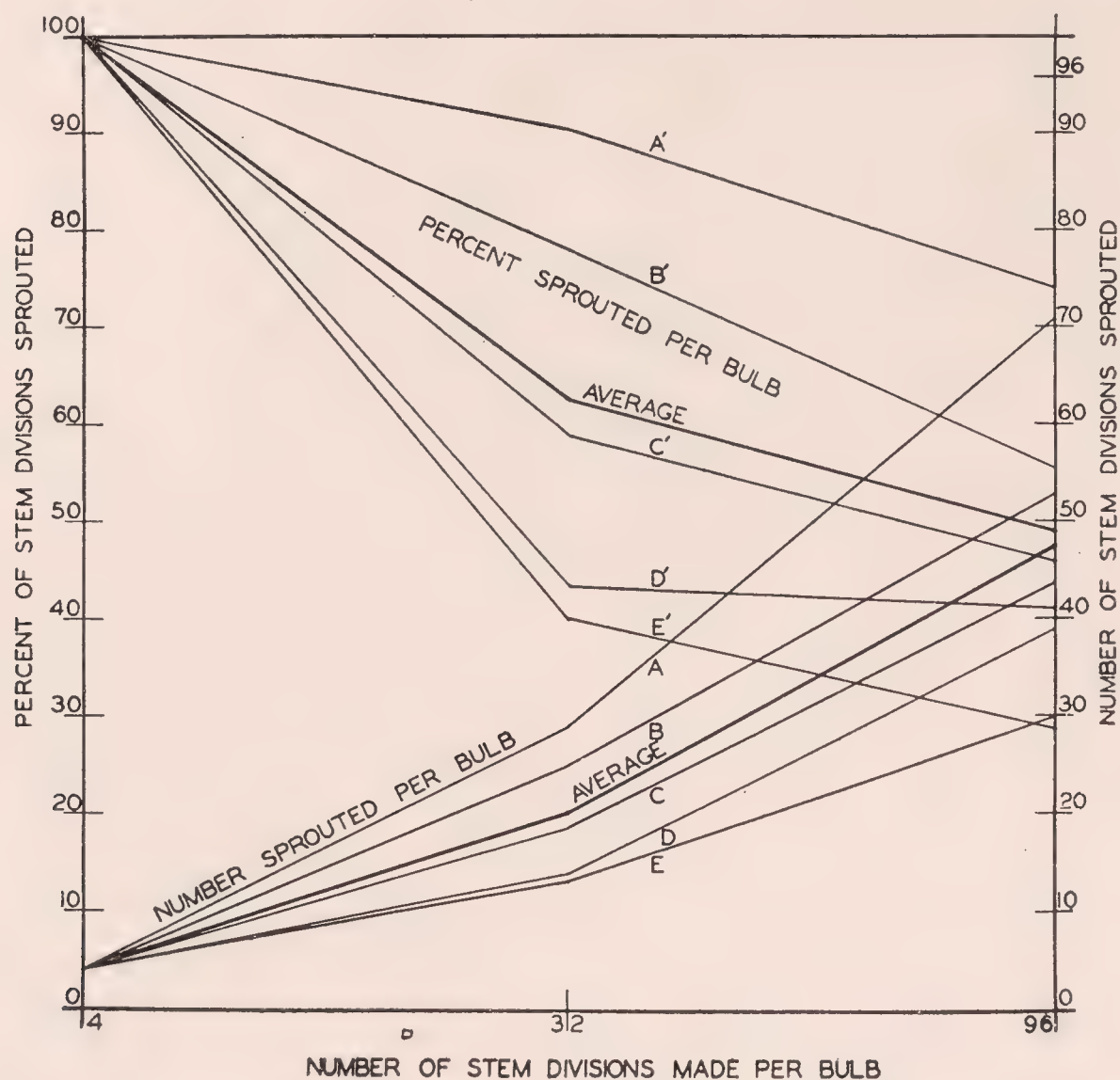


Fig. 2. Graph showing that the per cent of stem fractions sprouted per bulb decreases from 100 per cent to 49 per cent (average of A¹, B¹, C¹, D¹ and E¹); and that the total number sprouted per bulb increases from 4 to 47 bulblets (average of A, B, C, D and E) as the number of stem fractions cut per bulb is increased from 4 to 96.

The method of procedure with hybrid *Hippeastrum* consisted in cutting the bulb vertically into sections which were further sectioned horizontally. The final fractions consisted of a part of the stem and leaf scales. Three treatments were included,—(a) bulbs cut vertically into four fractions, (b) bulbs cut into 32 fractions, and (c) bulbs cut into 96 fractions. The method is very simple involving cuttage vertically and horizontally,—(a) vertically the bulb is cut first into halves each of which is again cut into equal portions making 4 fractions; each quarter is then cut into halves making 8 fractions which are again halved giving 16 fractions as shown in Fig. 1. (b) Each of the 16 fractions is then cut horizontally into 6 fractions making a total of 96, as shown in Fig. 1. This is the procedure with 2½ inch diameter bulbs. Larger bulbs may be cut into a greater number of fractions.

The fractions were planted in flats in a propagation medium of equal parts of granulated peat and coarse sand. From November to February, the flats were set in the open, and were then moved into the lath-greenhouse with half shade. Water was sparingly applied, but the propagation medium was not allowed to dry out.

The stem cuttage experiments with Nehrling-Mead strain hybrid *Hippeastrums* were begun in November 1933 and the final data were recorded in July 1934. The results are presented in Table 1, and Fig. 2.

Results. The Nehrling-Mead strain is a hybrid mixture resulting from the intercrossing of various species and hybrids and it would be expected that variability in sprouting response would be shown. A study of the data shows that the percent sprouted per bulb decreases as the number of divisions is increased, but the total number sprouted per bulb increases with an increase in the number of divisions. The average number per bulb is 4 bulblets or 100 per cent with four fractions; 20 bulblets or 62 percent with 32 fractions, and 47 bulblets or 49 percent with 96 fractions. It should be noted that the number sprouted in the case of 96 divisions, for instance, varies from 30 bulblets or 31 percent to 71 bulblets or 74 percent for individual bulbs, indicating that clonal varieties may be selected which will give results above the average presented in this paper.

It is interesting to note that fractions from the lower part of the stem are more apt to sprout than those from the upper part.

The best time to carry on the operation is after the bulbs have made their full growth following flower production. The bulbs are then provided with the maximum food reserves. With the Nehrling-Mead strain, the late winter and spring flowering strain in Florida, the full growth is made by late July and August, and the operation may be carried on through November. Cuttage of bulbs in the spring immediately after flowering has given poor results. The leaf scales are apt to die back to the stem and although a certain percentage of the fractions will sprout the total results are disappointing. The effect of the temperature, moisture, light and sprouting medium factors on the results should be studied in detail in future work.

The results secured with the stem cuttage method with species in genera other than *Hippeastrum* are very encouraging. No tabular data will be presented here since a detailed report on this work will be published later.

One bulb of *Crinum fimbriatulum* cut into 4 fractions vertically in 1933 gave rise to 8 thriving bulbs; one bulb of *Hymenocallis carabea* cut into 4 fractions in 1933 gave 4 bulbs; bulbs of *Narcissus tazetta*, Grand Soleil d'Or, cut into 4, and 8 fractions, gave 6 and 7 bulbs respectively.

The results with *Haemanthus multiflorus* are very encouraging—one bulb cut into 16's gave 8 plants for the lower part of the bulb, and five for the upper part, a total of 13 bulbs or 81 percent. The response is rapid. Bulbs should be cut when dormant, just before flowering. Plants from the lower divisions are stronger than those from the upper.

A modification of the cuttage method has been developed for use in the case of rare bulbs when increase is desired without interfering too much with the blooming of the mother bulb. A slice is cut from the stem at right angles to the leaf blades in case of flat bladed types. The portion removed must not be too near the center. The slice of stem, with attached portions of leaf scales, is then cut into as many divisions as is desirable. To date the method has been applied only to the variety of hybrid *Hippeastrum*, *Wyndham Hayward*, (Traub, 1934) which has made no offsets and *Crinodonna howardii*. The writer was able to retain his original bulb of the *Hippeastrum* variety and present three bulblets to Mr. Hayward for whom the variety was named. In the case of *Crinodonna* the response was slow but certain. The original bulb has been retained and quite a number of bulblets are sprouting from the divisions.

Conclusions. The popularization of amaryllids has been unduly retarded in the past by slow natural increase in some of the most important species and hybrid varieties. The vegetative propagation of amaryllids is now, however, beyond the academic stage and there is no excuse for the hoarding of superior varieties on the basis that increase must be from offsets alone. It has been shown that the method is a biological success, and only minor details need to be worked out in order to improve it still further.

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5. Culture

Lycoris Squamigera in Woodland

CARL H. KRIPPENDORF, *Ohio*

Lycoris Squamigera is perhaps the most exotic looking flower hardy in regions having zero temperatures in Winter. In color the flower is an inimitable rose-lilac. It seems perfectly fool-proof, as it is with us absolutely free from disease or insect enemies and altho liable to sulk the first year after transplanting it is of fairly rapid increase and will thrive for many years without transplanting. There is, however, one drawback that lessens its value as a plant in the garden proper and that is the heavy narcissus-like foliage that comes up in this latitude in mid-March and grows all thru the month of April, then about mid-May the foliage begins to turn yellow and it takes about a month for it to ripen. All of this time it is a most untidy looking plant and an eyesore if used in quantity in a garden. However, naturalized in woodland this is no serious handicap as the yellowing foliage is covered by the natural growth and is not unpleasantly noticeable. We have these naturalized in many thousands in woodland consisting largely of matured maples and beeches and in this situation they thrive to perfection on the hillside or flat, in sunshine or shade, with no care except mowing the weeds the last of July.

Usually about the first of August the bloom stalks begin to break through the ground and in less than a week they are twenty-odd inches high and the first flowers are open. Grown in this way in large masses they make a stunning garden picture which is not possible, as far as I know, with any other garden material in deep shade in midsummer.

We find that we are most successful with fairly shallow planting, with the tip of the bulb scarcely one inch below the surface.

We have no regular program for dividing the clumps of bulbs but usually let them stand until there is no longer any increase in the number of bloom stalks to the clump. Generally the maximum is from seven to ten stalks, which will take from six to ten years after division. When this condition is reached we lift immediately after blooming, taking care to dig with as many roots as possible. We divide to single bulbs and try to replant the same day, as these bulbs seem to have no real period of rest and make very poor growth the next year if the roots are allowed to dry out. Planted carefully at once a fair proportion will bloom the first year, most of them the second and the third season quite a few will have two to four flower stalks.

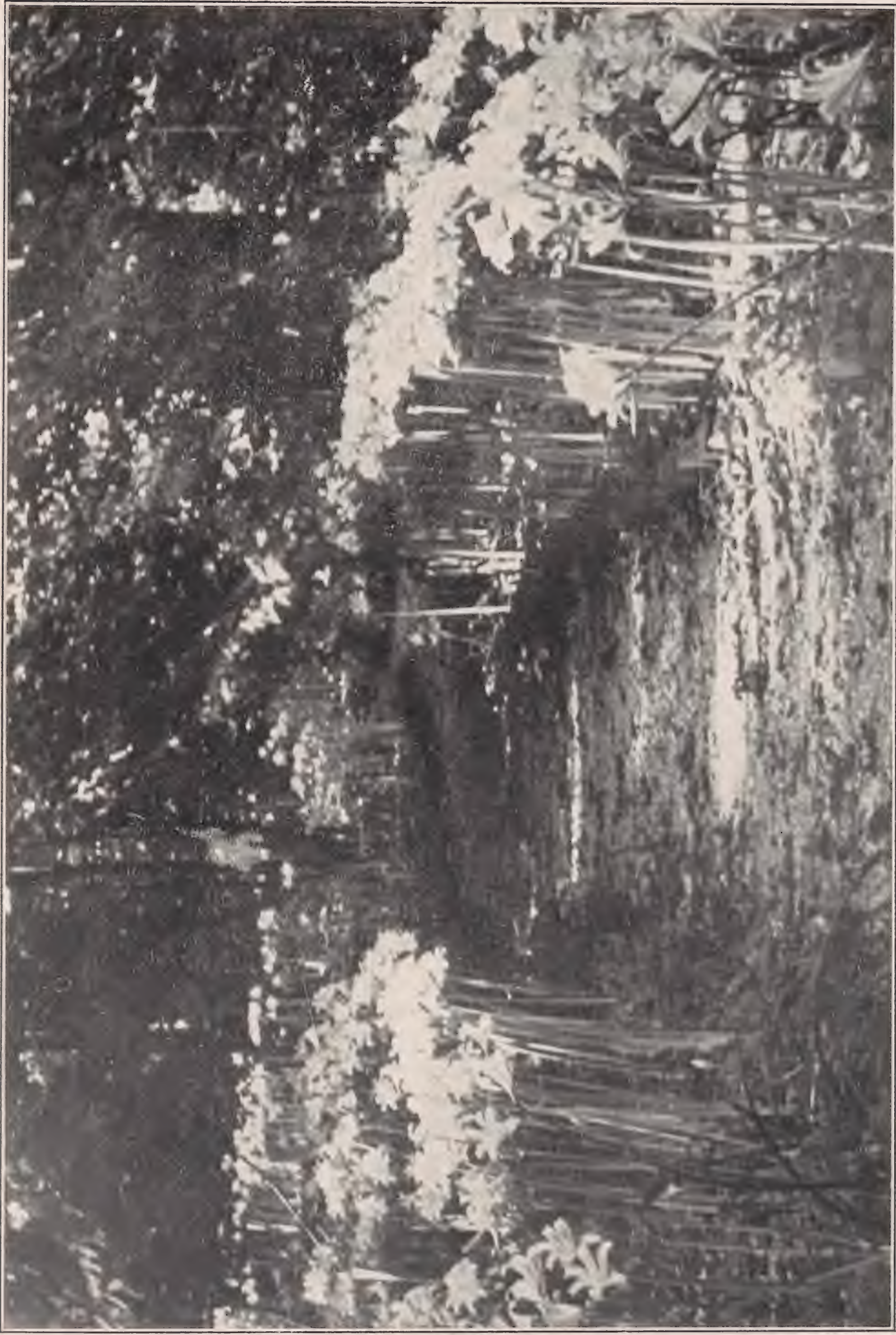
This flower seems to have a universal appeal as without exception every one who has seen them in bloom has been desirous of obtaining a stock; it is particularly beloved by the owners of small gardens and I hope that after they learn how easy they are to grow more and more will be encouraged to have them in their gardens, as I know no garden material that is more permanent and requires less attention. (See illustration on page 128).

Amaryllis as House Plants

HENRY H. BUXTON, *Massachusetts*

The Northerner who loves a garden, refuses to face five long months without one. Comparatively few of us have conservatories; our only outlet is the window sill, and we count ourselves blessed if those windows face the south. Of course, we may grow ivies and many other foliage plants in the north and west windows, but for blooms we must have the sun.

No more gorgeous flower for the window garden exists than the amaryllis, and it is one which the amateur need not fear to grow. Let us suppose that you decide, in the fall, to buy some bulbs. First, buy good bulbs—do not buy them in the ten



Lycoris squamigera naturalized in Ohio Woodland; Krippendorf Country Estate
Carl H. Krippendorf

cent store, nor in a department store, for these bulbs are apt to be the odds and ends left after the first quality bulbs have been sold. So buy the best bulbs you can afford from a reputable florist or seedsman. The bulb will probably have very short roots, quite possibly no roots at all. Before it can grow leaves or flowers, it must grow roots, and you must wait patiently while it does this. Some set the bulbs in moist peat moss until the roots start, but they may be started at once in soil if you choose. If the bulb is blooming size, select a six inch pot, wash it, inside and out, and put an inch of broken crocks in the bottom. Over this a little peat moss, to prevent the soil from sifting through the crocks. The soil should be a mixture of two parts garden loam, one part well rotted cow manure and one part sand. The bulb should be set so that it is nearly three quarters above the soil, and there should be about two inches between the sides of the bulb, and the side of the pot. Do not fill the pot to the brim with soil—leave it half an inch below the top for watering space.

After planting the bulb, water thoroughly and set in the cellar, where the temperature is about 50. Water sparingly until the buds begin to appear. Usually the buds come before the leaves and not in the center of the bulb, as one might expect, but a little on one side. At first, it is difficult to tell whether it is a leaf or a bud that is coming,—both are creamy white, but the edge of the bud is thicker than a leaf edge would be. They may appear from four to six weeks after planting, and the flowers will open in another four to six weeks, no two bulbs developing at quite the same speed. After the flowers pass, and the leaves come, redouble your kindly efforts, for on the healthy leaf growth depends next year's flowers. While the thick glossy leaves are growing in your sunniest window, the tiny flower buds are forming in the heart of the bulb. Spray your plant often enough to keep the foliage clean and shining, and when spring comes, set the pots outdoors. They may be sunk in the earth near a shrub, where they will get partial shade. Ours were set in a large cold frame on the south side of the barn, where they got full morning sun and partial shade in the afternoon. Spray frequently on sunny mornings, using a fine spray, and reaching both sides of the leaves. Top dress with well rotted manure, and water once a month with liquid manure, which should be about the color of weak tea.

During the summer, we tried to rid our plants of a diseased condition. The under side of the leaves showed streaks and spots of red; pulling off the dried brown outer husk of the bulb, we found red patches on the bulb. We first noticed it on the bud stalks, at blooming time, little red spots on one side, which increased in size as the stalk developed. Frequently it bent over on the infected side, the red spots became holes, growth was stunted and some times the stalk rotted off. We used powdered sulphur, at this time, but without marked results. In the summer, we waged more vigorous warfare, removing as much of the infected part as possible and dusting bulb and leaves with "Semesan" twice during the summer, alternating with a spray of "Fungine." We kept this up all summer, and while the cure is not 100 percent, conditions are much better than last year.

When September came, the big sturdy leaves began to turn yellow at the tips, and we gave less water. The last of the month, we removed the pots from the frame and laid them on the side in an open shed. The leaves ripened quickly and fell off, and the pots were then taken to the cellar, where they rested, cool and dry, until early in December, when tiny buds were found on two bulbs. These early comers grew very slowly. No more were found until Christmas eve, when one more appeared, but from January on they came fast, and it was great sport, hunting them with a flash light in the dim cellar. If the soil in the pots seemed very dry, and the bulb a bit soft, that plant was watered so that the bulb might harden. When buds were found, the plant was well watered and brought up to the warm kitchen, where for a week or more it set on the floor, with only a subdued light, until the bud was safely through the narrow neck of the bulb. Then the pot was placed in a sunny south window until the gorgeous flowers opened and was then transferred to the front windows, with a northeast exposure, the morning sun giving just enough warmth to keep the color, but not enough to fade it, thus prolonging the life of the flowers to ten days. The pink and white flowers were placed in the parlor window, at one side of the front door, the scarlet and maroon ones in the library windows on the other side, and foliage plants banked around them to conceal somewhat the bare stems. And how the neighbors and the passersby enjoyed them! It is surprising how few people know what they are, and how many



Henry H. Buxton

Hybrid Amaryllis (Hippeastrum) as main feature in window garden

want to know. The telephone jingled often with eager questions, which usually ended with "Where can I get them?" A small boy, gazing at them said, "Say, mister, are them big flowers made of paper?" His judgment was shared by a woman in a passing trolley who said "I shouldn't think they would put paper flowers in among their plants!"

One year, I bought a monstrous sized bulb, nearly as large as a baby's head. The first bud appeared March 6th, seven weeks after planting and on April 11th, there were five flowers and a bud on one scape and two flowers and four buds on the second scape. The flowers were a very dark cardinal red, almost maroon, with a white stripe on each of the three upper petals, and were about five inches in diameter. Later, another bud appeared, between these two, and this also produced six flowers. No leaves appeared until the flowers were nearly gone. As the flowers developed, the huge bulb grew smaller and smaller, shrinking until it was no larger than a base ball,—a very soft, spongy ball. During the summer, we fed it well, and it gradually hardened, growing a good crop of leaves, but it never attained its original size, and so far—March—has not budded this year. This experience is just a little more proof that the biggest is not necessarily the best, but that the medium size bulb gives the best results.

It would be a great advantage to window gardeners if amaryllis bulbs could be bought in colors, or named varieties. Buying as we must do now is "buying a pig in a poke". All colors may be beautiful, but all are not desirable for the window garden, especially if your house is set back from the street, and you enjoy sharing your beauties with the public. Dark reds, while lovely at close range, do not carry well. Twenty feet away, they merge into the background and are lost. But all the light colors show up beautifully, giving much joy to the beholders.

During the winter a new pest appeared,—some sort of a mealy bug, but quite different from the round, fat little villain we find on our coleus. This bug was about one eighth of an inch long, and the microscope showed him equipped with a pair of horns, six legs and three tails,—a fearsome beastie! We sprayed the plant well with lemon oil, which the other mealy bug dislikes so much, and are hoping for good results. The leaves begin to show dark spots on the under side, probably where the bug has sucked the juice, and perhaps these spots may later turn red and solve another problem.

Some Notes on Outdoor Amaryllid Culture in South Carolina

RUSSELL S. WOLFE, *South Carolina*

Although the outdoor culture of narcissi has been successfully carried on in South Carolina on a large scale for a number of years, the outdoor culture of the amaryllis (*Hippeastrum*) hybrids has been undertaken only recently.

I have not made an exhaustive study of *Hippeastrum* culture nor have I visited all the plantings in South Carolina; therefore, my notes only concern those which have come under my observation.

Most of the *Hippeastrum* hybrids in South Carolina are grown from seeds bought from a traveling representative of a Florida firm. Quite a number of individuals bought these seeds and planted them; but, comparatively few have been successful in growing them: the main cause of failure is apparently due to improper treatment.

Of the plantings that have come under my observation, only one was in a ground bed of a greenhouse, the remainder were planted outdoors, all in June 1931. Although the bulbs made good growth from seed, there was a comparatively small percentage of blooms until last season (1934), and this year (1935) they are blooming profusely on nice long stalks and with many blooms per stalk. The greenhouse planted seed gained some time on the outdoor planted seed, perhaps six months, reckoned by the comparative number of earlier blooming bulbs.

Slight protection from winter cold seems necessary, otherwise, some bloom injury may be experienced from late cold spells. Some unprotected bulbs were

killed during the unusually severe winter of 1933-34. Perhaps nearly every type of fertilizing material has been tried; but better response was secured from the use of organic fertilizing materials in a balanced mixture.

The *Hippeastrum* hybrids are blooming profusely at this time (April) at Magnolia Gardens near Charleston, and the larger planting of Mr. Easterling at Denmark is in excellent condition as to foliage and bloom, and certainly attracts many visitors and receives well merited favorable comment.

About 1928 I became interested in the *Hippeastrum* hybrids, having noticed various articles stating that the new hybrids were so much an improvement over the old types, etc. but, upon seeking information about the culture and source of good bulbs, I was very much discouraged by authorities, one of whom stated “. . . if they can be grown in South Carolina at all, which I doubt, the bulbs would have to be planted so deep they could never bloom”. However, I had seen “Johnsonii” blooming here regularly every season as long as I can remember (there are some Johnsonii bulbs in my front yard among the shrubbery that have been there blooming every season for more than thirty years) and this challenge induced me to try my luck.

After considerable correspondence, finally a few small bulbs of good stock were obtained and planted in pots. The advised treatment and planting directions were so carefully carried out, that it took two seasons for the bulbs to bloom. These potted bulbs were inadvertently exposed to our winter weather one season without injury, which convinced me of their hardiness. By this time I had acquired quite a number of bulbs since I had secured both bulbs in small lots, and seeds from recommended sources from different sections of the United States. Several crosses were made with the best blooms and this season (1935) quite a number of my own seedlings are blooming, which in my opinion compare favorably with any I have seen anywhere. One of my sets of crosses was made with the idea of obtaining a pure white bloom, and among the blooms are some whiter than any I have seen elsewhere.

Our spring season varies considerably from year to year as to lateness of cold weather, and the blooming dates vary somewhat accordingly; but, they are usually in bloom during April and May. Some of the bulbs bloom more than once during the year. Last year (1934) some were flowering when frost killed the bloom stalk and foliage. Quite a number are very fragrant.

The normal increase of offsets in the field is satisfactory for some individual bulbs, fair for some and poor for others. So far as I have information, no propagation by cuttage has been attempted in South Carolina. Most of the bulbs are planted in three foot rows, in the open. The soil is usually sandy loam and is worked by horse or mule. One planting which we visited was located in a field protected by woods, (on new ground) which offered some natural shade. The plants were apparently benefitted thereby. Some bulbs, especially small bulbs (1st year seedlings) are planted in beds and seem to do equally as well.

A number of other amaryllids are cultivated in South Carolina but this is possibly only a fraction of those that could be grown here. The *Hemerocallis* grow nicely and bloom profusely with little or no cultural care. *Nerine sarniensis* grows to perfection here. Some naturalized planting that I know have been here for more than twenty-five years. They bloom and bloom season after season. Several types of *Hymenocallis* are growing here and seem to do nicely. Two types noted are especially desirable and deserve more extensive use. There is only one clump of *Lycoris aurea* in this section to my knowledge which came from an original bulb planted forty years ago. *Zephyranthes atamasco* grows wild in our lowland woods, and does equally as well in our flower gardens. *Z. carinata* does exceedingly well, blooms profusely and is naturally a rapid propagator. *Z. texana* seems weak and small under our conditions.

Several old types of crinums are often seen and they grow, bloom and multiply almost like weeds.

The History and Culture of the Miniature *Hippeastrum* in Texas

REV. C. W. HALL, *Texas*

If having thrived for more than a quarter of a century under diverse circumstances is proof of the adaptability of a plant to a particular section of the country at least one species of miniature *Hippeastrum* may be said to have proven its adaptability to the State of Texas. And since a number of the southern states have characteristics similar to these under which the miniature *Hippeastrum* has succeeded in Texas one may confidently claim for it the ability to adapt itself to a large portion of the South. As a matter of fact, reports from other sections of the country point in the direction of its ability to succeed in the less mild portions of the United States.

While considered a state with a mild climate sub-zero weather at times occurs in Texas even as far south as Austin. These severe cold snaps the miniature *Hippeastrum* has successfully withstood. Occasionally its foliage, which appears in the early fall and continues in growth throughout the winter, is frozen to the ground, but soon afterwards new foliage is sent up by the deeply buried bulb. The long neck of the bulb, often ranging in length from four to six inches, is a valuable asset on such occasions.

Another evidence of the suitability of the miniature *Hippeastrum* for general cultivation in this section is the fact that it does not seem to be particular about its soil, its location, or its care. About Austin may be found a variety of soils ranging in heaviness from the black soil characteristic of much of Texas to the sandy soil found in many other sections of the state. The miniature *Hippeastrum* seems to thrive in them all, and this it does without much attention being given to it. In one particular yard it has flowered in the sod for more than fifteen years without being disturbed. It is needless to say that under such conditions it is not at its best. It is usually described as carrying umbels of four to six flowers on stems eight or ten inches in length. Last fall in a well favored spot in partial shade stems were found twenty or more inches in length and carrying umbels of unusually attractive blossoms. It readily shows its appreciation of the proper care.

Because of the hot and dry summers many flowers are grown with difficulty in Texas. The miniature *Hippeastrum* has the advantage of making its growth and of doing its flowering during the cooler and more moist months of the year. On the eve of autumn the bright flowers suddenly appear, and soon afterwards the bright green foliage makes its appearance. This foliage continues its growing and storing of blossoming energy until the late spring. After it dies down the bulb rests during the summer months under its covering of soil.

As stated elsewhere in the Year Book the species of miniature *Hippeastrum* referred to in this article was imported by the late Mr. P. H. Oberwetter from Chile. Last fall a specimen of flowers and foliage of the species he imported was sent for identification to the National Herbarium, Smithsonian Institution. It was examined by Mr. E. C. Leonard who stated that it appeared to be *Hippeastrum miniatum*, which the late J. G. Baker regarded as a mutant of *H. advenum*. It is found here in Austin in two colors, blood red and pink. The red for some unknown reason is far more plentiful; in fact, the supply of pink is exceedingly limited. The indications are that the largest single stock of the red is to be found in this section, due no doubt to the fact that at an early date Mr. Oberwetter recognized the adaptability of the miniature *Hippeastrum* to the peculiar climatic conditions of the South.

Blaauw's Morphology of Organs and Periodicity in *Hippeastrum*

We are fortunate, indeed, to have received a copy of a brilliant research by the celebrated Dutch scientist, Dr. A. H. Blaauw, on the morphology of the organs and periodicity in hybrid *Hippeastrum*¹. The work is presented in two parts (a) the

¹ A. H. Blaauw. "Organvorming en Periodiciteit van *Hippeastrum Hybridum*" Proc. K. Akad. Wetensch. Amsterdam. 1931 pp. 1-90.



Haemanthus multiflorus

R. E. Morrison

formation of the flower and leaf, and (b) periodicity in *Hippeastrum*. The subject is covered in detail with many excellent illustrations. Those especially interested in this subject will want to read the English summary which is appended to the article. Only the briefest summary of the most outstanding contributions to the subject are presented here.

Dr. Blaauw shows that the inflorescence is the termination of an axis with four foliage leaves, the flower buds being terminal and not lateral as commonly supposed. Each vegetation point which is to form the following four foliage leaves and flower terminal is seen to arise as a small spot from the base of the existing vegetation point. "About every three months a new growing point is formed, which after leaf development and flower formation is again replaced by the next one." The bulb at any one time contains several stages of flower development.

Mira Flores,
Orlando, Florida

HAMILTON P. TRAUB.

Haemanthus in Florida

WYNDHAM HAYWARD, *Florida*

The *Haemanthus*, regarded as one of the most striking and spectacular blooming bulbs in all horticulture, bears its blooms in a close cluster of many small flowers at the top of a sturdy spike one to two feet in height.

At least one species of *Haemanthus* is perfectly at home in the well-drained sandy soils of central Florida. It has been tentatively identified as *Haemanthus multiflorus*, one of the finest and showiest of the genus. It has umbels of bloom nearly a foot in diameter, perfectly globular in shape, and of the warmest scarlet color.

The bulbs grow to three inches in diameter, with large bases on old specimens. They produce offsets liberally.

Bulbs of this species have been noted in cultivation at Artesia, Florida, next to the Atlantic Ocean, at Orlando, in the central part of Orange County and a large colony of them has been located in the city of Eustis, in Lake County. This last colony was reported to the writer by Mr. R. E. Morrison, a retired florist and Amaryllis enthusiast of Tavares, Florida. Mr. Morrison kindly supplied the photograph from which the accompanying picture was reproduced. It shows one of his *Haemanthus* bulbs in full bloom. Only a color photograph could do justice to the flame shade of the flower.

The bulbs go dormant in November or December, and remain so until about the first of May. At that time they begin growth, first sending up the bloom spike before the leaves appear. In Florida, *Haemanthus* rarely sets seeds even by hand pollination. After blooming, the leaves, usually one or two in number, grow up gradually becoming two feet or more tall in good specimens. The leaves are oval and a rich green in partial shade. They narrow to a petiole an inch or so wide at the base.

At Eustis the bulbs have been perfectly naturalized in sandy loam, growing up year after year and multiplying in the open ground with no care besides occasional weeding and fertilizing. They are apparently not at all exacting in care after becoming established. When better known, and when commercial stocks are available, it should certainly become a popular conservatory and greenhouse plant in this country, besides being a gem for gardens in Florida and the Lower South, Texas and California.

Mr. E. O. Orpet, of Santa Barbara, Calif., has reported a colony of *Haemanthus coccineus* naturalized at an old ranch in that state, and at least one other *Haemanthus* species is known to be in the trade in this country, besides the hybrid variety "King Albert of Saxony". This species is *H. altilineata*.

Naturalizing of *Eucharis* and *Clivia*

WYNDHAM HAYWARD, *Florida*

The year since the publication of the 1934 Year Book has given time for more study of the possibility of naturalizing *Eucharis grandiflora* and *Clivia miniata* and its hybrids.

Previous authorities have repeatedly stressed the supposed necessity of having these bulbous specialties well established and "pot-bound" to assure satisfactory blooming. This led to a popular misconception, also repeated by other writers, that the two could only be handled in cultivation in pots, or at least be handled best in that manner.

Inquiry in the last year has disclosed that it is possible to naturalize the *Eucharis* and *Clivia* under proper conditions, which are primarily those of a rich, moist, well-drained soil, partial shade.

At Arcadia, Florida, in the Peace River valley, there is a notable group of *Eucharis* naturalized on the East side of the Arcadia Hotel. The bulbs are perfectly at home, in rich soil, and when observed in February, 1935, were blooming freely with long vigorous spikes and large flowers. Gardeners and nurserymen in Polk county, Florida, have also demonstrated that *Clivia* plants, set out under similar conditions, with added protection from the direct sun rays, also grow thriftily and bloom well under Florida conditions. They need good drainage, adequate moisture and established root systems, to produce good spikes of their orange-yellow blooms in the spring.

A warning should be given to *Clivia* growers in sub-tropical climes, where occasional winter frosts are possible. *Eucharis* bulbs, being entirely underground, are not injured by frosts, only losing their foliage. The new leaves soon appear, and blooming is merely delayed a while. *Clivia*, however has no true bulb, only a semi-bulbous stem, and is very susceptible to frost injury, and a damaged plant may rot away to the heart or base and die. Even if the outer leaves are "touched," the plant becomes unsightly, and blooming may be interrupted. Another year of thrifty growth will be necessary to bring it back to normal condition.

Frequently a *Clivia* may lose nearly all its leaves due to frost or other injury, but nevertheless will sprout out two or more stoloniferous suckers at the base. For this reason, some time should be allowed to elapse before throwing away a plant with good root system, which is apparently damaged beyond recovery so far as the foliage is concerned, to allow such offsets to develop.

Growing Amaryllis in a Small Greenhouse

D. C. ROYER, *Colorado*

I am eligible to discuss this subject so far as the small greenhouse is concerned, as mine is 8x18 by 5 feet on lower side. It is built on the south side of the garage and heated from a gas water heater placed in the garage and the heat piped into the greenhouse. I have the thermostat set for 50 degrees minimum and have had very satisfactory heating.

I am an insurance man and a backyard flower enthusiast, but have no scientific knowledge whatever about plants—just an amateur and collector of new and rare plants. For years I have been growing Glads as my hobby, but they are so easy to grow and so plentiful that they cease to be a hobby. So I have taken to the Amaryllis for hobby No. 1, but from my present experience I may be compelled to drop it as a hobby.

I have said and continue to say, "They are a queer animal." I suppose that is what makes them so interesting and gives one a thrill when he achieves success. I have over seventy-five plants about equally divided between old ones—two year seedlings and one year seedlings. About four of my old ones bloomed last year, and so far this year, not a bloom appeared. They have nice large leaves and look healthy.

I had the good fortune to visit in Orlando, Florida, last October and met both Mr. Hayward and Mr. Heaton. It was a pleasure to visit these men and get first hand information from men of experience.

I became interested in getting some business for these growers. I sold around fifty bulbs to florists and also bought a few for myself. All that I sold did splendidly and came into bloom in a short time. I gave two of mine to a neighbor, and he kept them in the house and in forty-eight days he had wonderful blooms.

I potted mine and put them in the greenhouse and waited and waited for results. They were very slow in starting and a few bloomed but very poor blooms and not satisfactory. As I am writing this article, June 1, I have four that were potted in early February that are showing wonderful blooms, but I brought them into the house over two weeks ago. My old ones were rested during the months of November and December as per information gathered from different sources, but now comes Mr. Diener and says "do not rest them." I would like to read a discussion pro and con on this subject.

I also find in Mr. Diener's book that the temperature should be kept around 70 degrees for best results, and I now believe that temperature has been my difficulty. I inquired of our local florists who bought the bulbs and their temperature has been around 60 to 65 degrees. My temperature went down to 50 degrees every night all winter. If I must keep my house at 70 degrees just for my Amaryllis, I must give them up as a hobby. I am hoping to be able to hold blooming backward till in May in the future, if possible. I am wondering just how long it is practical to hold them dormant.

Mr. Heaton cut one of his bulbs in pieces and showed me the small resting flower bud, also the little leaf stalks. Now, I would like to know if any treatment they may receive will kill this germ and if not, why do they not send up a flower stem even though it may not be a perfect one. In other words, how does the treatment they receive affect this undeveloped flower and its blooming, even though it may not be perfect?

I fear this article is of no value to anyone in the way of information. If these problems can be solved for me, I am sure I will be the one to get the benefit derived from writing this article. Any information that will help me solve my difficulties will be thankfully received.

June 1, 1935,
Greeley, Colorado.

Restoring the Vigor of Devitalized Amaryllis Bulbs

JOHN R. SPRINGER, *Florida*

In the 1934 Year Book of the American Amaryllis Society, it was reported that Mr. Theodore L. Mead's personal collection of Mead Strain Hybrid Amaryllis were deteriorating due to unfavorable growing conditions and lack of time and opportunity on his part to maintain them in the best and most ideal growing conditions. Many of the bulbs had "sloughed" their roots and tops and were so devitalized and shrunken they could actually be rattled around in a sort of pocket in the sour, hard, unfriendly soil.

Mr. Mead realized that this collection, valuable from sentimental and historic reasons, would soon be only a memory if some steps were not taken to rejuvenate the bulbs. In the late summer of 1934 he therefore asked the writer if he would take these bulbs and see what could be done to restore them to health and vigor. Many of the bulbs were located only by the assistance of "Clayton" the faithful colored gardener who had tended them so many years that he knew just where they "ought to be".

Each bulb was carefully rubbed free of dead skin and rotted parts, the root ring was trimmed flush with the base of the bulb and all soaked in a solution of Mercury bi-chloride at a strength of 1-1000 for one hour. Without being rinsed in clear water they were quickly dried in the sun and planted in beds under one-half slat shade

in rows 18 inches apart and spaced 4 inches apart in the rows. The soil in the beds had been prepared several weeks previously by turning under large quantities of local air dried peat and the soil sweetened by the addition of hard wood ashes at the rate of one and one-half tons to the acre. All fertilizer has been applied to the soil by broadcasting and washing it in with irrigation water and has consisted of nothing but equal parts by weight of 10% animal tankage and ground tobacco stems. In the first six months since planting, four applications of this mixture have been made, equivalent to a total amount of one ton to the acre. Irrigation has been frequent and adequate and the beds kept free of weeds by hand.

Results have surpassed the most sanguine hopes. Growth response has been prompt, vigorous and healthy and coupled with a large and active root system the bulbs are rapidly regaining their size. Best of all; this spring about 75 per cent bloomed. The scapes had only two and three flowers of small to average size, but the fact that they bloomed at all indicates a return toward normalcy and their one time splendor.

Palladin's The Formation of Red Pigments in Wounds on *Amaryllis Vittata*

(Reprinted from *Berichte der deutschen botanischen Gesellschaft*, 29, 132, 1911.)

Abstract *

Pieces of *Amaryllis vittata* bulbs, when placed in an ordinary room slowly desiccate. If however the pieces are soaked in water for a few hours and then kept in a moist atmosphere, the formation of the familiar red pigment begins. Oxygen is necessary for the production of this coloring material; exclusion of oxygen or treatment of the wounds with a reducing agent prevents pigment formation. Bacteria are not concerned in the production of this substance. It is formed through the oxidation of a colorless antecedent of the pigment after cell death, although the increased activity of the surrounding cells in a living condition, brought about by the wounds, is responsible for the development of the color. Bulb pieces in which all cells are dead do not develop color. The coloring material is not a respiratory pigment.

The pigment was isolated as a non-crystalline solid and its ability to dye silk was tested.

Polyanthus Narcissus in Florida

WYNDHAM HAYWARD, *Florida*

The Narcissus varieties of the Polyanthus group are all regarded as types of the general species, *N. tazetta*, the native habitat of which ranges from Southern France to South China, in a large number of variations. They are always found in a warm climate.

This group is among the most important of the genus *Narcissus* both horticulturally and commercially, as there are probably more bulbs of the "Paper White" variety alone sold in the markets of the world each year than of any other narcissus variety. Thousands of city dwellers with no room for outdoor gardens, know the blooms of this fragrant "bunch-flowered" type. Its sales in department and chain stores, run to large sums annually.

The principal bulb farms for the raising of Polyanthus *Narcissus* are in Florida, Texas and California, in the United States, as well as in favorable locations in the south of Europe. Commercial "Paper White" plantings exist in America as far north as Oregon and the Carolinas.

* Abstract by R. F. Ruthruff, Indiana.

The "Tazetta" group has received less attention in the hands of the hybridizer than any other group of the narcissi. The familiar "Paper White" is an old variety, grown for possibly 200 years with little variation or improvement, except a selection of larger-flowered types. The "Grand Soleil d'Or", with a golden yellow perianth and an orange-red cup, and undoubtedly the finest of the polyanthus varieties, is reputed to have originated between 1780 and 1790. I have no record of the age of such varieties as "Grand Monarque," "Chinese Sacred Lily," "The Pearl," "Double Roman," "Gloriosa," and others, but they were all known many years ago.

Dr. David Griffiths, the late bulb specialist of the United States Department of Agriculture, has pointed out what a fruitful field for the hybridizer exists in the "Tazetta" group, even in Florida. It is somewhat difficult to set seed on Polyanthus *Narcissus* varieties, at least in Florida. The writer has never seen seed set on any but the "Paper White" and "The Pearl" in Florida, and then only two or three times out of millions of blooms in the fields. But with the vigor and floriferousness of the "Paper White" for the seed parent, and the beautiful coloring of the "Grand Soleil d'Or," or some of the introduced varieties as other pollen parents, some wonderful results might well be obtained.

The blooming season of these *Narcissus* varieties varies. This is fortunate for the commercial grower of cut flowers, under open field conditions, as he is able to obtain a succession of bloom from bulbs planted at the same time. The first to bloom in Florida are the "Paper Whites," starting well before Christmas, and continuing for more than a month. Before they are through, the "Chinese Sacred Lilies" and "The Pearl" enter their season of flowering. These are followed closely by the noble "Grand Soleil d'Or," which continues blooming through January and into February. A field of these golden blooms in January under a warm winter sun is an inspiring sight.

The "Grand Monarques," the most vigorous of all the types, come last into bloom, late in January, and put forth bloom scape after bloom scape, sometimes lasting well into March. A large bulb will produce a number of scapes of fine blooms. The "Paper White" will sometimes do this under optimum conditions. The "Grand Monarque" makes the largest bulbs of all the varieties, at times more than 22 cm. in circumference.

Bulb sizes are by centimeters, and a 12 cm. bulb is regarded as the smallest blooming size. Anything under that is classed as planting stock. The normal bulb size depends on variety, 17 and 18 cm. for "Paper Whites" and "Grand Soleil d'Ors," and occasionally up to 22 cm. for "Chinese Sacred Lilies."

The "Paper White" is the commonest variety, and as the result of overplanting in the last 15 years, has come to be more of a grower's liability than an asset. Tons of the flowers are shipped out of Florida in the winter to the Northern flower markets, where they compete with greenhouse grown stock, and bring ridiculously low prices. The prices obtained for the bulbs are generally very low in comparison with actual costs of production. A few locations are regarded as more favorable to the production of high quality bulbs, and stock from those areas sometimes brings a considerable premium.

There are growers of long experience who will go so far as to say that the Polyanthus *Narcissus* has never been entirely at home in Florida. The problems of soil conditions, fertilizing, bulb diseases, insect pests, nematodes, and poor markets have made the path of the grower difficult in the last few years. At the present time he is still further threatened by the announced termination of the *Narcissus* quarantine by the United States Department of Agriculture late in 1936. Imposition of this quarantine gave *Narcissus* culture in Florida a strong initial impetus, and brought about the planting of large acreages of the bulbs in the warm-climate state.

The "Chinese Sacred Lily" is of medium popularity as a forcing bulb, and commands a medium price. The "Grand Soleil d'Or" is king in the price field, and good stocks of the bulbs are scarce. It is a slow propagator, and subject to heavy losses from decay following improper growing conditions and unfavorable weather. The bulbs of this variety may sell for six times as much as "Paper Whites."

"The Pearl" and "Grand Monarque" bulbs are rarely seen on the market, although they are excellent cut flower varieties, and satisfactory for garden use. They are said to be "poor shippers" for florists' use. By planting different varieties at the same time, or by a succession of batches of "Paper Whites," a continuous season of winter bloom may be had by either the Southern planter or the northern florist. Except for the "Paper White," which may be forced in bowls of pebbles and

water, the other types are best grown in soil. The forcing in water, of course, ruins the vitality of the bulb.

The "Chinese Sacred Lily" has a white perianth and a brilliant orange cup. "The Pearl" is white with a pale yellow cup. "Grand Monarque" is similar to "The Pearl" except that it has larger heads of flowers and the individual flowers are also larger in size. "Double Roman" is reputed to be a double form of the "Chinese Sacred Lily," but is not in much demand. The bloom is so heavy that the flower sometimes hangs rather low. A few fanciers consider this attractive.

Polyanthus *Narcissus* require approximately the same culture for all varieties. This is a rich, moist soil, with good drainage, and abundant commercial fertilizer if good blooms and the best quality bulbs are to be raised. A soil slightly heavier than what is usually considered "good Irish potato land" in Florida suits them well. They have a fair tolerance for soil acidity. There must be a heavy share of humus in the soil to produce large, sound bulbs, with satisfactory increase.

The bulbs should be kept weeded at all times while growing, and frequent cultivation is regarded as necessary on heavy types of land.

The bulbs are propagated by removing offsets or slabs after digging in the months of May and June. They are planted back in September and October, in furrows, three to six inches deep. A few growers are of the opinion that deep planting makes for larger bulbs. After planting, the bulbs quickly come into leaf growth, and after blooming gradually ripen their foliage. When this yellows and dies down, they are ready to dig.

After digging, the bulbs are dried a few weeks, then the slabs are separated from the mother bulbs and the "round" bulbs or good commercial stock is packed for market. Most of the shipments are made in August.

The offsets or slabs are grown on another year to produce the "round" or commercial bulbs of the next season's crops. A certain supply of the round bulb is usually planted back in the fields, to maintain the good character of the stock. All crops are carefully rogued at blooming time to remove undesirable types and sports and to keep the strain clean. The "round" bulbs are "round" only one year, becoming "mother bulbs" and producing slabs in their turn ever afterwards. While their blooming capacity is unchanged, they are not wanted in the trade after passing the "round" stage except as planting stock.

Polyanthus *Narcissus* are not hardy to any extent. A slight frost will not injure foliage, or even blooms, but a hard freeze will ruin the bulbs.

Hybrid Amaryllis Culture

I. W. HEATON, *Florida*

The economical production of hybrid amaryllis bulbs depends upon many conditions. The selection of seed stock is foremost and should receive very careful consideration and study as this bears directly on production costs and may mean a difference of a year or more in producing a crop.

Only the very finest bulbs should be used for breeding stock and their history several generations back should be carefully studied, as one characteristic may mean the difference between a profit or a loss on the crop. We use for seeding only bulbs which have made at least a three inch bulb in two years from seed, crossing such individuals with the original male parent. This male parent has bloomed in two years and has produced offspring in the same time. It has therefore proved itself and insures a rapidly growing crop of seedlings. Since the present trend of popular opinion seems to be toward the Leopoldi type, only this type males should be used. Our entire stock of reds came from one male parent No. 554, a U. S. Department of Agriculture seedling Leopoldi type, flowers 8½ inches in diameter, crossed with Mead strain Reginae type. Seedlings selected from this cross bred back to No. 554 produced the reds which won most of the awards at the first National Amaryllis Show in 1934.

The use of flats will materially reduce the cost of seedling production. Steam sterilization of the soil pays large dividends in increased stands, quicker growth and reduces weeding to a minimum. Soil made from cow manure, muck, decayed oak leaves and coarse sand in equal parts does best for us producing an average of 950

seedlings $\frac{1}{4}$ inch to $\frac{3}{4}$ inch in diameter in seven months from a 20 x 30 inch flat. The pH of the soil mixture should be between 6.80 and 7.00 and hardwood ashes should be added from time to time to maintain the pH at this point. All indications point to the desirability of early transplanting to the field as the bulbs seem to take hold and grow quicker if set early. In resetting offshoots from old bulbs we have found that it does not pay to reset mixed stock which will not make commercial bulbs in one year. The market price does not justify the expense of caring for mixed stock two years.

The use of chemicals as a source of ammonia (nitrogen), during the winter has been justified as organic materials break down too slowly during periods of cold weather. We have tried this spring a new mixture,—300 lbs. fresh cow manure, 50 lbs. Calurea, 200 lbs. Acid Phosphate, and 50 lbs. Sulphate of Potash. This mixture analyzes about 5-7-5 and costs less than \$20.00 per ton for the materials. Another years experience has verified our opinion on the necessity for cover cropping land used continually for hybrid amaryllis as continued clean cultivation soon wears out the soil and the bulbs make better growth in partial shade.

Our opinion is that amaryllis will assimilate nitrogen, phosphorus and potassium derived from most of the usual sources of these elements and do well if fed in sufficient quantities. However they seem to object to any materials which leave a chlorine residue in the soil.

Alstroemerias in Florida

WYNDHAM HAYWARD, *Florida*

These distinguished plants have not received the attention they deserve in the United States, except possibly on the Pacific coast, where they are grown in California, Oregon and Washington on a commercial scale, in many instances for cut flowers. They are also a striking note in many private gardens.

They are an unusual plant for the beginner to handle, and for this reason there is much uncertainty regarding their culture and propagation. There had been doubts expressed as to their adaptability to the Florida climate when the writer took up the inquiry into the group more than two years ago. However, a chance discovery of a plant growing thriftily in the garden of Mr. Theodore L. Mead of Oviedo, Florida, proved that they can make themselves perfectly at home in the state.

This was also shown at the Jacksonville Flower Show on May 2, 1935, when there were a number of fine spikes of *Alstroemeria* blooms on display in the numerous arrangements and exhibits. Mr. Mead reported that the plant had been growing in his bulb garden for over 10 years without other attention than an occasional weeding. He said it bloomed well and multiplied in spite of the little care he gave it. In Jacksonville, Mrs. John H. Churchwell supplied the information that the plants were fairly common in gardens and that they prefer good soil, and partial shade. Those seen in the Jacksonville Show had deep red blooms.

The flowers are usually small, an inch to an inch and a half across, and vary in color with the variety. The roots of different species or varieties are of varying shapes, some slender and tuberous, while others have roundish oval clusters of tubers. The eyes are produced from the tubers in much the same way as sprouts rise from dahlia roots. The tubers may be raised from seed, or obtained by dividing up an old plant. They are fairly hardy, being able to survive outdoors with a little protection as far north as Vancouver, B. C., and Washington, D. C.

It is apparently well in the sub-tropics to plant the roots in the Fall in rich, well-prepared soil, in a semi-shady place, the medium being a sandy loam, with good drainage, and also a constant supply of moisture. In the greenhouse they are grown in pots. They usually have to be established a year or more to bloom well. In England the catalogues recommend planting them in 'a sunny situation, such as under a South wall,' with a light covering in winter.

Growing from seed is quite unsatisfactory, as the plants may take a year or more to come up, and then sprout as thickly as can be. It is said that fresh seed gives more prompt germination. The writer obtained some three-year-old seed in spring, 1934. It was planted in a flat and nothing happened for eight months, when

in disgust the earth in the flats was tipped out and used again for sowing seeds of hybrid amaryllis and tritomas. The latter gave a poor stand, but lo and behold, late in the winter of 1934-35 the *Alstroemeria* seedlings began to come up in profusion among the amaryllis and tritomas. Some other *Alstroemeria* seed, planted in August, 1934, has not yet come up, in June, 1935. Such species and varieties as *Alstroemeria aurea robusta*, *A. aurantiaca*, *A. aurantiaca splendens*, *A. chilensis*, *A. chilensis hybrids*, *A. lutea*, *A. pelegrina alba*, *A. pelegrina rosea*, *A. Braziliensis*, *A. psittacina* and *A. tricolor* are listed in the English and Dutch bulb catalogues. Some of these have been imported into the United States and a few are available in the trade here. The usual colors run from yellow to orange and rose. The plants make an abundance of bloom for cutting with very good keeping qualities, when properly grown.

Alstroemerias are native to South America, many of them from Peru. It is interesting to note that this group holds the record, so far as known, for "farthest south" of any amaryllid, Holmberg reporting one species from Patagonia (Tierra del Fuego) in the neighborhood of Cape Horn. (*Alstroemeria patagonica*, Philippi)

Culture of Hybrid Clivias

E. P. ZIMMERMAN, *California*

The name *Clivia* for this important Genus was given because a specimen first bloomed in cultivation in the conservatory of Lady Clive, Duchess of Northumberland. The plant was also called *Imantophyllum* by William Hooker, but *Himantophyllum* would be more correct, as it means "strap-leaf".

The first plant recorded was *Clivia nobilis*, from the shady shores of the Fish River in South Africa. Other species and varieties which are mingled in the hybrids of today, are: *Clivia miniata*; *Clivia miniata*, var. *lindenii*; *Clivia cyrtanthiflora*, *Clivia gardneri*.

Clivia miniata—the name *miniata* is derived from the Latin word *minium*, (red oxide of lead) and describes the color of the flower. The first blooming plant ever exhibited was shown at the London Flower Show in 1854, and won the Banks Medal at that time. *Clivia lindenii*, a variety of the *miniata* species, is a mutant and is a broad-leaved stately plant, with light cream to orange flowers. It is sturdy, very hardy and free-flowering. The umbels of flowers are more compact and the flower stems shorter in this variety. This plant, crossed with *Clivia nobilis* brought some of the more than 60 variations into the modern hybrid *Clivias*.

Clivia cyrtanthiflora has flowers like a *Cyrtanthus*, another South African amaryllid, and was first grown by Van Houtte at Ghent, Belgium, from a cross between *Clivia miniata* x *nobilis*. It was first shown in bloom at the Berlin flower show in 1859.

Clivia gardneri, Hook, is a species imported from Port Natal and Transvaal, South Africa. It grows five to six feet tall. It is not as floriferous as *Clivia miniata*, but the flowers are twice as large. A well grown plant of this species is a beautiful sight.

The modern clivias are derived from the five types and species mentioned above. Increased sturdiness and floriferousness are characters which the hybridizers have tried to impart to the newer generations. This plant is easily grown as a house plant, and will be found as decorative as a palm, even when not in bloom, if a few simple cultural rules are followed,—keep the plant in full shade, and water when necessary. Under good treatment they will sometimes bloom two or three times a year.

There are today some 60 types of hybrid clivias in cultivation, varying in the shape and form of the flowers and the colors. They make their growth of leaves immediately after the flowering season, (February-April) in California. When the leaves are well matured, that is, by June or July, is the time to transplant them. They should be kept in as small pots as possible, until they lift themselves out of the pot with their root growth. If the grower will observe these simple instructions, he will have the pleasure of obtaining from two to 25 flower spikes per plant in a year, depending on the age and size.

Clivias resent being moved around to any extent. They want to be left alone, and should have good drainage at all times. An inch of sand at the bottom of the pot is essential.

A clay soil, or friable loam, mixed with sand and leaf mould, or ground peat is best for a potting medium. Occasional watering with liquid manure will repay the effort. A healthy plant should have dark, shiny leaves, and if the leaves turn yellow, it is a sign that the plant has not received the proper attention and the blooms will be unsatisfactory. During the warm summer months, clivias can be brought outside into the open air if kept in the full shade, and the pots plunged in the ground. They should be protected from winds, kept cool and moist, with an occasional thorough soaking of the nearby soil which will be found beneficial to the health of the plant.

The clivia dislikes continuous sprinkling and watering of the leaves. Once a month for this is sufficient. The soil around the plants should be maintained in a moist and cool condition and the plant should have an abundance of fresh air, with the reservation that the ventilation should be 3 to 8 feet above the plants. Moving air too close to the plant is detrimental.



E. P. Zimmerman

Hybrid Clivias

In the greenhouse or conservatory the clivias should be kept away from the glass, and out of the direct rays of the sun, and all moving air should be well above the plant.

If all these points are carefully observed, the culturist will have wonderful results with his plants, blooms that cannot be duplicated with any other. I have at my nursery in Carlsbad, several thousand of the plants in bloom every spring, the largest collection of blooming size plants of clivias in the world.

To summarize, in growing clivias, do not bother the plant any more than is absolutely necessary in the way of moving it; leave it alone; provide dark shade, the darker the shade, the healthier the plant; grow them in small pots; provide soil as described above; have adequate drainage; water when needed by the plant; transplant in July after the growing period, and water occasionally after that with liquid manure.

The plants are little affected by insects with the exception of mealy bug. If the plants are grown as indicated above, little trouble will be experienced from this source, as the conditions are not favorable to its spread and increased development.



Basil N. Ikeda

Semi-double Hybrid Amaryllis (Hippeastrum)

Mr. Ikeda of Yokohama, Japan, reports that in one season several bulbs produced semi-double flowers but in the following season single flowers were again produced.

6. Curing, Storage, Forcing and Cut Flowers

Forcing Hybrid Amaryllis in Pots

WYNDHAM HAYWARD, *Florida*

The proper time for the potting of hybrid amaryllis bulbs is a matter of considerable difference of opinion among commercial growers. Certain quarters favor potting or re-potting immediately after blooming. This is a frequent time for the transplanting of amaryllis selected in the field at flowering time. Blooming bulbs are often lifted from the field and potted up temporarily for exhibition at spring flower shows without serious results.

When the bulbs are already established in pots, the writer has found a successful and convenient time to re-pot them is just at the end of the drying off or dormant period in early winter, when the bulbs are beginning to show the first signs of spring growth. This has to be done with great care. The great majority of amaryllis bulbs are sold in the fall and winter months, from November to March, and are potted up immediately by those obtaining them.

Two outstanding matters are apparent in the case of potting up cured or dried bulbs in the fall and winter:—First, the bulbs must become well established by spring to produce satisfactory blooming results. Early potting, in November or December, is apparently best. Second, warmth and moisture are necessary to promote a thrifty root and leaf growth on the newly potted bulbs and in order to have them well established in the pots by spring.

In an experiment during the winter of 1934-35, the writer potted 25 dried and cured bulbs in prepared soil, in six-inch pots, December 1, 1934, and placed them outdoors, in a shady location, beside a shed. Despite regular watering and the usual moderate winter weather of Central Florida during most of this time, only two of these bulbs showed root growth when turned out of their pots six weeks later. In the six weeks, there was perhaps a fortnight of cool weather, climaxed by a "freeze" with temperatures as low as 27 degrees Fahrenheit, on the nights of December 11-12. At a few other times the night temperatures were as low as 35° to 40°, and day time temperatures averaged 50°-60° on a few cold days. The bulbs remained dormant, and were apparently unhurt by the cold weather.

On February 1, 1935, eight weeks after potting, not one of the 25 bulbs yet showed leaf growth, although several were beginning to produce bloom scapes. No decay was apparent in any of the bulbs. However, out of 75 other bulbs of the same lot, planted in rich, moist soil on the same day the 25 bulbs were potted up, but in the open air on a lakeside, more than half a dozen bulbs had bloom scapes a foot and more in height at this time. All of the bulbs planted in the open ground had good root growth established by February 1st. Several had vigorous leaf growth. On many nights of December and January the temperature under the surface of the ground must have been somewhat warmer than the air temperature above.

The following cultural directions for forcing hybrid amaryllis bulbs are quoted, because of their general interest, from the 1935 catalogue of "Barr & Sons, 11-13 King street, Covent Garden, London, England," noted bulb specialists:

"CULTURE—Pot the bulbs from December to March and plunge the pots to the rim in gentle, steady, moist bottom heat, giving very little water until the flower buds are formed. As soon as these begin to show, remove pots from plunging-bed. Thus treated, a vigorous leaf growth is produced, and a strong stem with a fine umbel of large flowers secured. In the absence of bottom heat, the bulbs may be grown in an ordinary greenhouse or sunny sitting room window, if potted up in February or March. After the bulbs have flowered, the pots should be plunged in

ashes until growth is completed, about the end of summer, when water must be withheld and the pots stored on their sides until the bulbs are repotted in December or later."

The Growing of Hybrid Amaryllis for Exhibition Purposes

WILLIAM T. WALKE, *Massachusetts*

In writing this article it is from my experience as a grower in our Northern States, being unacquainted with Southern growing conditions.

First make yourself acquainted with the schedule requirements and the date of the exhibition at which you expect to enter. You will find growing for an exhibition to be very interesting, very fascinating and educational. I think the amaryllis one of the easiest to grow and the most beautiful of the bulbous plants.

While the now common varieties are very beautiful, they have been improved so much of late years that for an exhibition one naturally wants the best types as to size, color and form in order to meet the competition one will naturally expect. In gathering your collection together, if you are situated where you can see the flowers, so much the better. If not it will become necessary to make your requirements known to the amaryllis specialist, who is in a position to give you a collection in selected varieties.

A very fine collection can be got together from hybridized seedlings but this takes time. In my experience three years or more. A very fine collection can be obtained from a good strain of the so called "field grown" bulbs, but it will be necessary to pot grow them for one year in order to produce the flower at its best.

Good culture will greatly add to the quality of the blooms which are formed the previous year. If you start with field grown bulbs, two to three inches in diameter, pot them in a good fibrous loam, about one-third sand. Also add a four inch pot of bone meal to the bushel. Place the bulbs one-half their height above the level of pot and keep evenly moist. Place in a warm and light position. When the warm weather comes in June, plunge your plants outdoors, up to the rim of pot, in the full sunlight. Keep well watered all summer. Feed with a fertilizer every two weeks when leaves commence to develop. By the middle of September it will be necessary to bring your plants under cover as then we expect and do get a frost. In growing a collection of plants at this time you will find that the leaves of some will have a tendency to turn to a yellow color, a good sign that the plant has developed its full growth. Then withhold water and lay away in a dry, frostless place until ready to start. Those that are not properly developed should be kept growing in the warmest and lightest place available until they have attained their full growth as described above.

Timing for the Exhibition is of course of very great importance, and this will depend largely on your temperature conditions. A plant properly matured, of a flowering size, should flower in a temperature of fifty-eight to sixty degrees Fahrenheit at night, in six to eight weeks.

Take your plants from their winter quarters and soak them well. Do not disturb the roots. Make sure the drainage is all right. Bring to the light. In a week or two you will see the flower scape appearing and then the leaves. Give a tablespoon of some plant food and keep watered well. You may find a difference of a few days in the development of the flower and the date of the exhibition, but that can very readily be timed by shading and placing where it is cooler if a little too far advanced. Place where it is warmer if backward. They will stand eighty degrees Fahrenheit if it is necessary.

Next in importance and by no means the least, it is necessary to transfer them to the exhibition hall without bruising, to which they are unfortunately very susceptible. I have seen very fine flowers ruined in transit and again I have shipped one hundred pots without a bruise.

My plan has been to place a three foot bamboo cane as upright as possible in the center of each pot, and fastening the flower spike to it loosely. That will keep the flower upright. Cut the stake six or eight inches above the flower when finished.

Then take twenty-four inch sheets of soft tissue paper and fold in strips of three inches. Wrap these around the stake and in and around beneath the flower heads until you have sufficient volume to hold the flowers rigid and make it impossible for the flowers to move regardless of any shaking they may be subjected to in transit. Use extreme care that the leaves do not break. At the hall place your plants in saucers, water and arrange properly and await the judges' decision. Then it is we learn by our experience how we can improve in the future.

Any plants you may have that are very much pot bound, should be repotted after flowering and given the best care possible for your next exhibition because age will greatly improve your collection.

Storage and Forcing of Amaryllis

WYNDHAM HAYWARD, *Florida*

Preliminary attempts in forcing of hybrid amaryllis outdoors in a sub-tropical climate during the winter months, primarily with the aim of hastening the blooming period of the bulbs, to have them in flower for Christmas, were conducted by the writer during the fall and winter of 1934-35. The results were largely negative, but in some ways rather interesting.

Two lots of blooming size bulbs were dug in the fields in September, 1934. One of 15 hybrid amaryllis, and the other of 50 hybrid amaryllis, 20 *Hippeastrum equestre major*, and 3 bulbs of common *H. johnsonii*. This may not have been the true strain of "Johnsonii", but was the one met in the trade under this name.

All these bulbs were shade dried and placed in cold storage before October 1, 1934. The cold storage plant is set to operate at a temperature of 35 to 45 degrees Fahrenheit continuously. The air inside the storage room was rather moist.

On November 30, the bulbs were removed from cold storage. They appeared in good condition, with the exception of the *H. equestre major* bulbs, more than half of which had started to decay and were thrown out. The other bulbs were then potted up, singly in 6-inch pots, with a prepared potting mixture. They were placed in the open air, in a sheltered location, beside a shed. In eight to ten days time, it was noticed that some of the bulbs had started to rot. No signs of the expected growth, either leaves or bloom spikes, appeared.

On December 11 and 12, there was a "freeze", with temperatures down to 27 degrees fahrenheit, which apparently had little observable effect on the bulbs.

By December 25, three of the bulbs had started leaf growth. No bloom stalks had appeared, nor did any appear at any time of the experiment, although all of the bulbs were of blooming size when dug. A large proportion showed definite signs of decay at Christmas time, and the tops of these bulbs were sliced off with a sharp knife, disclosing rotting tissues in the heart of the bulbs. In a number of the bulbs the center was entirely gone. More than 40 of the bulbs showed some signs of decay. The remaining *Hippeastrum equestre major* bulbs were found to have decayed completely through to the base.

The hybrid amaryllis bulbs were removed from their pots and the roots examined. Not one bulb was found to have started fresh root growth. The bases of 90 per cent of the bulbs were almost completely rotted away. The "Johnsonii" bulbs showed no decay, but did not start leaf growth until late in January. With the coming of warm weather in the spring, 1935, a few dozen of the bulbs revived and started to grow again in their pots, although mostly in very bad condition. Two or three seasons would be required to grow them on to commercial bulbs again. Only four bulbs remained quite sound.

As far as advancing the blooming date of hybrid amaryllis, the cold storage treatment, as outlined above, proved a complete failure. In fact it so severely affected the bulbs that they did not bloom at all. Whether the cold temperature to which they were subjected was too low, whether they should have been cured longer, whether the bulbs were even slightly frozen in the cold storage plant, or whether a shorter period of the cold application is necessary, remains to be determined.

It is still doubtful whether hybrid amaryllis will respond to cold treatment as do bulbous iris, daffodils, etc., in the effort to produce an earlier bloom.

Cold storage, however, in another minor experiment, proved an excellent means for retarding the blooming period of hybrid amaryllis, as shown by a study made in the spring and summer of 1934.

The normal blooming period of 90 per cent of the hybrid amaryllis under field conditions in Florida is February to April. Three bulbs were used in this experiment. They were dug along with others in January, 1934, and presumably had the current season's bloom bud already formed. They were air dried in shade for three months, and then, the three bulbs were selected for good dormancy, and were immediately placed in cellophane bags in the bottom of an electric refrigerator, where the temperature ranged from 40 to 45 degrees F., until July 1st, 1934. This was at least two months past the normal blooming time of these particular bulbs, and they should in all probability have flowered in late March or April outdoors.

On July 1 the bulbs were removed from the refrigerator, and were still in good condition, although slightly desiccated. They were potted up in prepared soil, and bloomed soon after planting, in ten days to three weeks after the time of their removal from cold storage. They bloomed, however, without leaves or root growth, and the blooms were inferior in size and length of stem. After setting seed, the bulbs began normal leaf and root growth and by the end of summer were apparently in good condition again.

Therefore the possibility remains of keeping bulbs capable of blooming in cold storage at a moderate temperature until the following Christmas, or a period two or three weeks before the holiday. Blooms might be obtained for Christmas by this method, but it is to be doubted if they would be worth a great deal. Whether the long storage would devitalize the bulbs remains to be seen. Possibly if the bulbs were established in pots, dried off before blooming time in the spring, and then placed in cold storage, pots, earth and all, they could be brought into bloom for Christmas with the added vigor of established plants, which is an important factor in all blooming amaryllis. The time involved and expense of this procedure would probably exclude it except as a novelty.

Forcing experiments should also be conducted with the fall and winter blooming species of *Hippeastrum* in this country. Bulbs have been obtained from European nurseries. Both *Hippeastrum aulicum* and *H. reticulatum* are reported to be fall and winter blooming types. They are apparently not available in the trade in the United States at this time.

Robusta Variety of Zephyranthes

H. B. DEBOER, *Florida*

Zephyranthes robusta is native to South America and is beginning to show promise as a cut flower. Those who have used "Robusta" in the preparation of sprays, and flower blankets are quick to give it their approval. Its color is reminiscent of the orchid. The flower is trumpet-shaped as illustrated, 1½ to 2 inches in length and about 1½ inches in diameter. The stems range in length from 4 to 12 inches depending on the richness of the soil in which they are grown.

"Robusta" seems to thrive best in moderately rich soil composed of ¾ sand and ¼ leaf mold. It blooms in Florida from May through June and in northern climes in June and July. As a border plant in masses it is unexcelled, making a beautiful display since it is a steady bloomer and produces flowers after each shower of rain. In planting for border effect the bulbs should be planted close together as they thrive better that way and give mass display.

After the blooming period is over allow the bulbs to remain in the ground 30 days or until the seed pods have formed and the leaves start to die. Then dig them and allow to dry on trays. These are made of "chicken wire" on a wooden frame placed on legs about six inches high. After the foliage has dried and the root system has become dormant clip off the tops and roots and store as you would the average bulb, in a cool dry place until the next planting season.

"Robusta" produces both from seeds and bulblets, the seeds however soon lose their viability and should be planted as soon as they reach maturity. They multiply from bulblets very rapidly and much better results will be obtained from this form

of propagation. The bulblets require about one year before they will produce flowers.

Zephyranthes robusta can be grown in the North out of doors after the danger of frost is past. The bulbs should be planted about 2 inches apart in an upright



H. B. DeBoer

Zephyranthes robusta

position in trenches about 2 inches deep and should be covered with top soil. If planted out of doors the average rainfall in eastern United States will keep the plants in good condition.

Crinums for Florists' Use

CECIL HOUDYSHEL, *California*

Crinums deserve more attention from commercial florists. We remove the single open flowers and attach toothpick and use in sprays quite effectively. So used the flowers rival the true lilies. They keep sufficiently long for funeral work. We also use the long stems in basket work. The cut stems open out their flowers and last a long time.

Country florists who must raise their own flowers will find them very useful indeed.

7. Marketing

The American Amaryllis Society was organized for the advancement of the Hemerocallideae, the Alstroemeriales and the Amaryllidales. Its object is to encourage the appreciation of these groups of plants by holding exhibitions, publishing the Year Book, and establishing trial collections, and to consider basic problems,—the working out of the phylogeny of these groups, the introduction of new varieties and species, breeding methods, vegetative propagation, etc. These activities are of importance to all who are interested in these groups of plants. The details of marketing, for instance, may be based in part on ideas developed as a result of the activities of the members, but the Society is not a marketing organization. The Board of Directors has, however, considered it advisable to offer this section, for an indefinite period, as a forum to those interested in the marketing of amaryllid bulbs. The opinions of the writers are printed as information only.

Vegetatively Propagated Named Amaryllis Varieties for the Trade

I. W. HEATON, *Florida*

Last fall while in New York I inquired of the bulb dealers the prospects and marketing possibilities of named Amaryllis varieties propagated vegetatively. Every dealer I talked to was interested and wanted to know when and where he could purchase bulbs produced in this way. Vegetatively propagated bulbs will place amaryllis in the hands of the florist in sufficient quantities for forcing; it will be the salvation of the industry, and should increase the market hundreds of times. One Chicago grower wants 20,000 for forcing this year but will have to wait several years before such an order can be filled.

Last summer we cut every good seedling we had and recut the bulbs produced in 1933, about 1,800 in all, and wish we had more stock. To date we have set in the field some 70,000 and have the last lot yet to plant. Our stand was much better this year, than the last three years. Bulbs thrive best when cut in August through September. Later cuttings have not produced as well. From the first 200 separate bulbs propagated in August we have set an average of 43 each, with a high of 132 and a low of 6. These bulbs were cut into 54 and 68 pieces depending on the size of the bulbs. We found one small piece had made four bulbs and others had produced two and three each. We have heard of several cases of failure; the causes appear to be either too much moisture or drying out. The propagation medium in the flats must be kept moist but not wet and it should be of such composition as to drain off the surplus water quickly. Sand and German peat appears to be the best, mixed half and half by volume.

Marketing of Hybrid Amaryllis

JOHN MASEK, *Florida*

Pleased though I am to have been asked to write on this subject, I must frankly indicate at the outset, that I have nothing to offer in the way of any new or special marketing plan.

I think it might be well to list the most general outlets that a grower has for his bulbs. This list would run something like this,—

1. Local buyers,—
 - (a) Amaryllis growers who grow and ship.
 - (b) Local marketing agencies.
2. The wholesale trade.
3. The flower forcer.
4. Merchandise Chain stores.
5. General merchandise stores.

As with all bulb growing industries, the first principal buyers are the pioneer growers, who need additional bulbs to fill orders over and above their own output. These same growers continue to emphasize the marketing phase of their business more and more as it goes on, principally because they have developed marketing connections simultaneously with the development of their stock. Evidence shows that at this point in the development of any bulb or plant industry, the problem is more one of getting a supply sufficient to meet the demand. Prices at this stage are usually so attractive that the business attracts other growers, with the resulting general tendency that soon a point is reached where there are more bulbs than can be easily disposed of. Then someone shades the price, and the old story is repeated. Mind you, I am not trying to be pessimistic about the future of the growing of amaryllis, except to indicate the alarming parallel with other horticultural products with which I have had some experience.

I am also aware of the fact that with amaryllis, as with other bulbs and horticultural products, there may be a surplus of bulbs at any given time, insofar as total quantity is concerned, but there might be a shortage of specific sizes, varieties and colors. I believe the amaryllis industry had already reached this point some two or three years ago, and real sales effort had to be made to move the crop. It of course follows that at one time or another some grower or shipper has more orders than he can take care of, but this might not be true of the average grower. As a result, the other marketing outlets that I have mentioned receive some attention. Or to put it another way, someone makes it a special business to call the product to the attention of sales outlets that up to this point have not been approached.

Such a procedure is carried on by some Northern wholesalers working in close cooperation with Florida growers. Or sales effort has been made by local packing and shipping organizations who specialize in horticultural products raised in the state, and whose marketing connections furnish good prospects. Here I mean to point out that the grower may either deal with a grower-shipper, a local horticultural marketing agency, or by working in combination with a Northern wholesaler. Sales of course can also be made direct to flower forcers, though as a general rule the individual grower is not prepared to make the investment in time and money that is required to cultivate this field.

With notable exceptions, if a plant or bulb has the essential requisites to make it popular—can be transported without great risk, planted and bloomed by the amateur, and offered at a price which will appeal to the masses—then it may find its way into the hands of the so-called merchandise chain stores. The buyers are men of experience—their aim is to give the buying public the best “buy” possible. They are in the advantageous position of being able to purchase in considerable volume. Sales to the merchandise chain stores are made only after years of effort. They try an item, let us say amaryllis bulbs. If it sells one year, next year they buy more, all the while looking for a dependable source of supply where it can be had at the right price.

One of the difficulties encountered by the merchandise chain store buyer is with respect to size, and in this he is helpless. The trouble starts because the American public, in a great many cases, assumes that value is in proportion to size. And so if the store manager sees that his customer buys size, then the buyer wants larger sizes. It has been my unhappy experience, for example, to be told that my 3 inch pot size ferns were not as big as someone else’s 3 inch pot size ferns. The point is that the competition in supplying the chain stores comes two ways, first, price, and then size. That is to say, some growers (in a falling market) quote the old price but increase the size.

This in a general way covers the more generally known outlets for amaryllis bulbs. In closing might I repeat some of the observations made by men and women with whom I have talked; First,—There is evidence to indicate that 90% of the crop will continue to be bought by the amateur gardener; Second,—That with the grading and classifying now going on, the forcer will use more and more bulbs, provided, of course, that he can get not only the specific colors, but the specific shades, and also bulbs that will bloom more or less together; Third,—Amaryllis bulbs should continue to sell in greater volume in the next few years because they are gaining in popularity.

Marketing Hybrid Amaryllis Bulbs

I. W. HEATON, *Florida*

The present condition of the Amaryllis market is due to the cumulative effect of several underlying conditions some of which are directly within the hands of the growers to remedy.

Unfortunately the results of the "plant amaryllis campaign" conducted several years ago by high pressure promotion methods is becoming more and more apparent. Amaryllis seeds were sold on the promise of marketing the bulbs produced. Seeds were purchased by many growers scattered from South Florida to South Georgia, most of whom knew nothing of amaryllis culture, and many did not have land suited to the requirements of economical bulb production. The failure of the seed merchants to market the bulbs produced has forced the individual grower to find his own outlet. This has resulted in every northern bulb house being deluged with offers of bulbs. In the office of a large New York bulb firm last fall, I looked over quotations from 65 growers. The price range was \$105 between the highest and lowest on bulbs of one size.

This practice has enabled the buyers to purchase bulbs on the basis of the lowest quotation regardless of the fact that most of the quotations were from growers who could not have filled an order for 250 bulbs of one size. Another contributing factor to price reduction is the job lot jobber, who having no planting of his own sustains no loss by price cutting, and who can under quote the larger growers and pass the loss to the small grower who has no other market. It is impossible for this type of dealer to supply bulbs of uniform quality when purchased from small plantings which receive materially different culture and are grown on different soil types.

The third and most important factor limiting the increase in the sale of amaryllis bulbs is poor quality, and this is directly within the hands of the growers to remedy. Considering that the bulk of amaryllis bulbs are produced by growers as a side line, and without any experience in hybridization and in many cases with little horticultural training, rapid deterioration in quality is not surprising.

During the early years seed was produced without regard to quality, and even yet little culling is done. Not 10 per cent of the bulbs produced in Florida at the present time are suitable for the florist trade which demands reasonable uniformity of types and clear, clean colors. On account of the higher production cost many growers have discontinued seed production and are relying entirely on offsets to maintain their plantings.

The trend in the sales of amaryllis bulbs is early fall and spring. The grower must be able to supply mature well ripened and cured bulbs from October 1 to April 1. With cool storage delivery may extend to June 1. This will result in increased sales by enabling the bulb houses to take full advantage of the spring and fall gardening seasons. In central Florida amaryllis bulbs mature in August and are more nearly dormant at that time than at any other period for a new flush growth begins with the September rains. Bulbs dug at this period cure better and show less shrinkage than stock dug later. All stock should be harvested by January 1 as the flower scapes begin to expand in the neck early in February. Early digging also enables the grower to replant and take advantage of the entire winter's growth.

Some criticism from a few bulb dealers has been directed against the industry for selling to the chain stores. It is claimed that this practice has injured and curtailed the sales through the retail channels. The writer does not hold this view. The chain stores have furnished a market for large quantities of small No. 3 grade bulbs which could not have been sold in any other manner, and which have introduced hybrid amaryllis bulbs to thousands of people who could not have been reached through any other channel. These bulbs were not suitable for the florist trade and had these bulbs been culled out and destroyed it would have increased the cost of the better grades and placed them out of reach of all but the fancier. While chain sales show little or no profits, they enable the grower to produce selected stock at a reasonable price.

Many growers persist in offering 2-2½ inch bulbs for flowering stock. Not over 25 per cent of the bulbs of this size will flower and nothing injures the industry as much as blind bulbs. Some growers in their eagerness for a few dollars have supplied late orders with bulbs dug while in bloom.

Amaryllis for Pleasure and Profit

S. R. NICHOLSON, *Florida*

My first experience in growing amaryllis was shortly after my arrival in Florida before "the boom". A friend, who had grown the bulbs profitably, told me that all I needed to do to make the start of a fortune was to set out a hundred bulbs and before many years I "should have thousands to sell". I bought one hundred one inch bulbs for \$5.00 and set them in a prepared bed. Some of them bloomed now and then, a beautiful orange scarlet shade, but apparently a few bulbs of some species of *Hymenocallis* was included among them and gradually took possession of the bed crowding out the amaryllis.

I gave the bulbs no care for ten years, and still, when I dug them up finally, I found thirty-six left around the edge. I know now that these bulbs were *Hippeastrum equestre major*. This is a very beautiful variety but if I had then seen the many shades and colors of the hybrid forms I might have become even more interested.

A few years ago I secured several Mead strain hybrid bulbs. I set them in sandy soil near some casuarina trees where nothing else seemed to thrive. They grew vigorously, and one sent up the most beautiful flower I had ever noticed among amaryllis. It was a beautiful pink; the blooms, four in number, each eight inches across, opened one after another and lasted more than a week. That bloom "sold" me on hybrid amaryllis. I bought more bulbs. Next year that same bulb grew two spikes and attracted much attention. A flower lover patron has tried repeatedly to induce me to sell this plant, but I am too much attracted to it to part with it. I cross pollenized the bloom and saved the seed. Then I began to make a study of amaryllis culture. So far, I have been unable to put into practice all that I have learned, but I hope to do so in time. I learned more from reading the first Year Book of the Amaryllis Society than from any other source.

I have not given the bulbs any special care; I water regularly, but my plants are often neglected. They seem to grow on this thin, sandy soil better than any other plant that I have grown. I use only raw bone meal, and occasionally add sulfate of potash to the water with which I water them. They grow readily from fresh seed and equally as well from offsets.

I think that the value of amaryllis as a shipping flower remains to be fully investigated. We accidentally broke a spike from a bulb which had previously given beautiful blooms. However we placed the broken end in a cup of water. That flower kept right on growing. The water was changed daily. Four florets eventually grew and blossomed. They were pale and washed out, but I believe if fertilizer had been added to the water the colors might have been normal. There is no reason, that I can see, if they will grow in this manner, why they would not make as fine a shipping flower as the gladiolus.

Many are not acquainted with the great variety of hybrid forms. The society is doing a splendid work in attempting to popularize the amaryllis; the members of the society should help the work along to the limit of their ability. One or two cannot accomplish as much as a group of people, working together harmoniously.

My planting is small and the profit comes mostly from selling potted blooming plants. Mead strain amaryllis usually bloom in the spring and the lighter shades sell well at Easter. A pure, or nearly pure, yellow would bring a good price. Let us hope some of the hybridizers may develop such a shade.

We displayed a blooming plant at our county fair. It had two florets open on Monday when we placed it on exhibition. Saturday evening, when we went to get it, the fourth floret was still standing open although the whole plant was sadly in need of water. Apparently it had not been watered all week. The good qualities of hybrid amaryllis are not appreciated sufficiently.

If potted plants are not sold one year they will bloom again the following year, if fertilized and cared for. I grow some in pots and some in the ground, but our soil is so poor that mine do better if potted. I have not been troubled with diseases as yet, but I suppose some may show up sooner or later.

A plant that will grow, bloom, and multiply under such adverse conditions of soil, heat, etc., as encountered in south Florida on the location where mine grow, certainly seems destined to rank among the great of the horticultural world.

Suggested Commercial Grades for Hybrid Amaryllis Bulbs

I. W. HEATON AND WYNDHAM HAYWARD, *Florida*

For the benefit of the commercial amaryllis trade and the protection of both the growers and the florists' industry the general adoption of improved standards of grading for hybrid amaryllis bulbs as outlined below, is suggested for consideration by the growers and the trade. These proposed new standards would remain operative until commercial stocks of good named varieties, produced by the new method of vegetative propagation by stem cuttage, have been made available for the trade.

The standards have been devised with the aim of being as nearly adequate as possible to cover all of the various types, colors and forms of hybrid amaryllis, without being too technical for practical use. The main purpose of the standards is to bring to the attention of the trade the fact that the value of an amaryllis bulb rests in its ability to produce normal, well-shaped, clean colored flowers of good size.

1. FLOWER SIZE STANDARD.

Grade No. 1. Exhibition Stock. Bulbs in this grade must be capable of producing well shaped, clean colored flowers 8 inches or more in diameter across the face of the flowers.

Grade No. 2. Selected Stock. Bulbs in this grade must be capable of producing well shaped, clean colored flowers 6 to 8 inches in diameter across the face of the flowers.

Grade No. 3. Field Run Mixed Stock. There is no standard for flowers in this grade. It may contain all types of hybrid amaryllis.

2. BULB STANDARD.

Bulbs in Grades Nos. 1 and 2 may be of any size above two inches in diameter when cured. They must be sound, free from disease or mechanical injury, well cured, with roots trimmed to 2 inches or less of the root base and with the leaves trimmed to the neck of the bulb. Since these bulbs are guaranteed as to grade and size of the flower by the grower, the size of the bulbs is not important, if above two inches in diameter.

Bulbs in Grade No. 3, field run stock, must be sound, free from disease, insect or mechanical injury, well cured, with roots trimmed to 2 inches of the base of bulb and with the leaves trimmed to the neck. The root base may be trimmed. Bulbs in this grade are to be graded after curing, into three sizes,—2½-3 inches; 3-3½ inches and above 3½ inches.

3. CURING STANDARD.

All bulbs to be cured on trays or racks for at least thirty days before sizing and packing.

4. PACKING STANDARD.

Bulbs in all grades are to be packed in paper cartons 12x10x15 inches, 100 2½ inch, 50 3 inch and 25 3½ inch bulbs in each, with adequate protection by paper to assure the bulbs reaching the purchaser in good condition during cold weather.

5. STANDARD COLOR NOMENCLATURE AND DESCRIPTION.

Although not perfect, the Fischer Color Chart, is easily available and is generally satisfactory for use with hybrid amaryllis. The use of this chart will enable the trade to describe fairly accurately any color likely to be found in hybrid amaryllis. Colors are divided into three classes,—(a) solid colors otherwise known as selfs, (b) whites with light markings and (c) striped or particolored.

6. SHAPE AND FORM STANDARD.

Botanically several types of amaryllis flowers are recognized but for commercial purposes two main types are sufficient, the others are rare in trade stocks.

(a) *Leopoldi*. These are the full open faced type flowers with the perianth limb measuring less than four inches from the center of the face of the flower to the base of the seed pod.

(b) *Reginae*. These are flower types similar to the above but measuring four inches or more from the center of the face of the flower to the base of the seed pod.

Modifications of Leopoldi and Reginae Types,—Rounded; This term following the types listed above, would denote a full faced flower with little space showing between the outer line of the petal tips and the intersection of the petals; *Pointed*; This term in relation to type would denote a flower with pointed petals in which the line of the petal tips would be more than 1½ inches from the intersection of the petals. *Examples of flower description*,—"8 inch Leopoldi, rounded, solid color, red to orange red; 7½ inch Reginae pointed, light red with darker veins and keel."

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AMARYLLIDS

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- 1 Chlidanthus fragrans
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- 1 Hippeastrum advenum
- 1 Nerine Sarniensis
- 1 Lycoris radiata
- 1 Sprekelia
- 1 Sternbergia lutea
- 1 Zephyranthes Ajax

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The above are all of the wide, round-petalled open faced Leopoldi type, with flowers measuring up to 12 inches in diameter.....**Price \$15.00 Each**

Unnamed Bulbs, equal to above, in all colors, including pure white**\$10.00 Each**

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APRIL 2-3, 1934

Grand Prize, Most Points
 Best Bloom in Show
 Best Leopoldi Type Bloom
 Best Display 10 Varieties
 15 Certificates of Merit
 12 First Prizes.

Second Annual Amaryllis Fiesta
Orlando, Florida
APRIL 3-4-5, 1935

Grand Prize, Most Points
 Best Bloom
 Best Leopoldi Type
 Best Reginae Type B
 Best Display 10 Varieties
 17 Certificates of Merit
 15 First Prizes

Second National Amaryllis Show
Montebello, California
APRIL 12-13-14, 1935

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Named Varieties awarded a First Prize or Certificate of Merit at one of the Amaryllis Shows in all types and colors, **\$2.50 each. Small Bulbs, \$1.00 each.**

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Due to unprecedented success in our methods of vegetative propagation, we are able to reduce the prices on all varieties this year.

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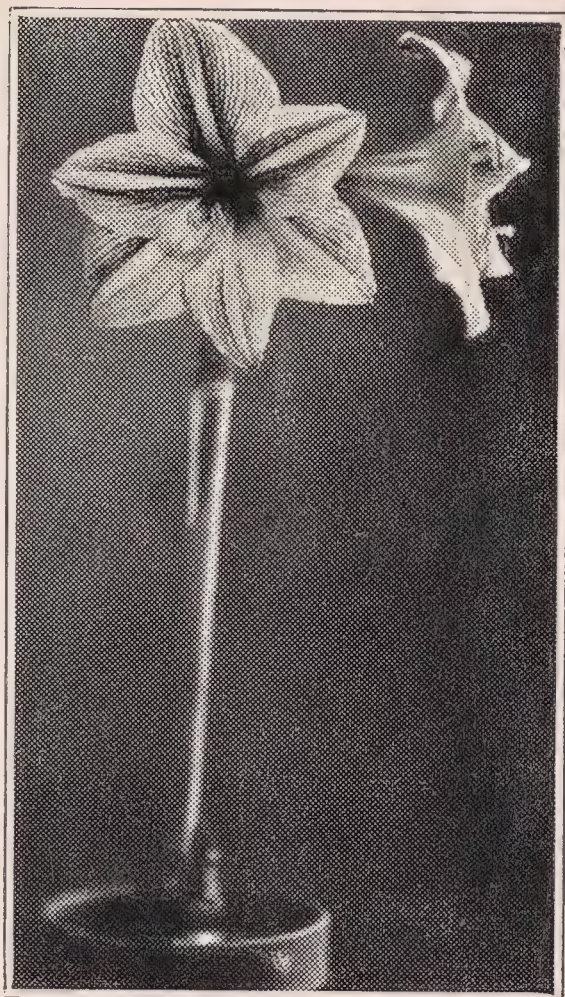
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**Also Gladiolus, Iris, Callas, and other bulbs, Cacti
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Crinum, Cecil Houdyshel received the "First Class Certificate of Merit for New variety" of The American Amaryllis Society at Orlando, Fla. 1935. Bright clean foliage. Deepest pink flower. Everblooming. **LARGE BULBS, \$1.50**

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HERBERTIA

VOLUME 3

DEDICATED TO
ARTHINGTON WORSLEY



EDITED BY
HAMILTON P. TRAUB
Mira Flores, Orlando, Florida

ORLANDO, FLORIDA
THE AMERICAN AMARYLLIS SOCIETY
1936

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ORLANDO, FLORIDA
THE AMERICAN AMARYLLIS SOCIETY
1936

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American Amaryllis Society

Printed in the United States of America
Published September, 1936

This Volume contains:
three portraits, one color plate,
and thirty other illustrations.

PREFACE

The kind of avocation, the advancement of the amaryllids, in which we are all interested, was really begun in earnest by the brilliant divine, William Herbert. Fortunately some of his thoughts on his hobby have been preserved to us in his *Amaryllidaceae*, published in 1837. They are as fresh today as if he had just uttered them, and almost every line of his essay, "On Crosses and Hybrid Intermixture in Vegetables" is pregnant with the wisdom and discernment of the born philosopher and scientist. His was a versatile genius, and everything he touched seemed to blossom forth. We will have an opportunity of honoring his memory in the 1937 *Herbertia*, which is the title of the present volume, and will be the name of your Year Book henceforth. The name is indeed appropriate since we all are trying to follow in his foot steps and are attempting to build on the foundation he so securely laid over a hundred years ago.

This volume of *Herbertia* is dedicated to Mr. Arthington Worsley who is by unanimous choice the Dean of the entire amaryllid fraternity. No one living has had as long an attack of amaryllid fever, or has worked in the field so broadly and with more genuine enthusiasm and success. His stimulating influence is appreciated in all quarters of the globe, and the American amaryllid enthusiasts are taking this opportunity of showing in a small measure their appreciation of his lasting contributions to the advancement of the amaryllids. They wish also to do honor to Mr. Worsley, the man—upright, generous and sympathetic. Those of us who have come to him for guidance and advice in their amaryllid problems have received every consideration—no detail was considered too unimportant for thorough discussion. His record, which is briefly sketched in his autobiography appearing in this volume, is one of which his native England, noted for great men, may truly be proud.

As we open the third volume of *Herbertia*, one of the most important aims of the Society has been accomplished. The use of the method of vegetative propagation of amaryllids, in those cases where natural increase is slow, has been generally accepted and is practised. In a reasonable number of years, we can look forward to the time when the best species and varieties will be available to all.

A beginning has been made toward the consideration of other subjects of importance to the members—the principles underlying the art of using amaryllids in the landscape, a complete inventory of amaryllid species, the evaluation of the many hybrids which are being introduced, the genetics and cytology of the amaryllids and methods of storing pollen, the growth of ideals with reference to types of flowers produced by amaryllid breeders, and other subjects of equal importance.

One of the outstanding articles in the present volume is Mr. Hunt's contribution on the use of amaryllids in the landscape. It will help us all in our efforts to make the best possible use of our plant resources. Who can so soon forget the "Sea of Atamasco Lilies"! It will encourage us to plan a "sea" of those amaryllids which are suited to our particular locality.

We are especially grateful to Messrs. Dyer and Compton in South Africa, who are opening up to us a wonderland of amaryllid species. Messrs. Standley and Macbride of the Field Museum are charting the wealth of material in tropical America.

Mr. Wyndham Hayward is doing very valuable work in making intensive studies of the amaryllids—some of the concrete results are presented in this volume. Such studies will lead to a critical evaluation of the plant material already gathered together. How he manages to accomplish so much is probably explained by his unbounded energy and unwavering purpose. The members of course know that the continued outstanding success of the Society can be traced to his door for his enthusiasm after three years has cooled not even one degree.

The creation of the Hemerocallis Committee with Dr. Stout as chairman is an event of great importance. The interest in this group is rapidly increasing which makes it desirable that problems peculiar to this group receive special attention.

Much valuable breeding material has been collected and this will be made available to the members as rapidly as possible. The "*Hippecoris Garfieldii*" bulbs are being propagated by the stem cuttage method and will be distributed to renewing members in 1937. Other items will follow as soon as practicable.

Mr. Percy-Lancaster of the Royal Agricultural and Horticultural Society of India is carrying on most important work on inheritance in amaryllids. *There is real need for more work of this kind.*

The inspiring article by the late Dr. David Griffiths on narcissi breeding in volume 2 is followed in this issue by an equally worth while contribution by Mr. Gibson of the Isles of Scilly Experimental Station. The Tazetta group of narcissi is apparently to receive the attention it so richly deserves.

In reading the reviews of the amaryllis shows one is struck by the steady progress in ideals as regards flower types. Three years ago, in spite of all the advice to the contrary, practically all had their minds set on the leopoldi-A type as the only goal for hybrid amaryllis. At the Third National Show practically all types were shown for the first time, including the ideal leopoldi-A types, and it was encouraging to note that *each* type was appreciated for its *individuality*. It is a well known fact, as pointed out by Mr. Hume, that interest in Camellias declined at one time because of too rigid limitation with reference to flower types. Above all we need variety, and more variety in amaryllids. Our organization without doubt is broad enough to make room for a number of flower types in hybrid hemerocallis, hybrid amaryllis, narcissi, and other amaryllids.

Our space is practically used up and we have touched on only a few of the outstanding contributions in this volume of *Herbertia*. Those not specifically mentioned here are equally worth while and will be appreciated by the membership.

Through the financial assistance of a member, Mr. A. C. Splinter, of Coconut Grove, Miami, Florida, we are able to reproduce the first color plate in *Herbertia*. *Leucocoryne ixioides odorata* will assuredly become one of the most popular subjects for naturalizing and winter forcing once its cultural requirements are fully understood, and sufficient stock is available.

As already indicated, the 1937 volume will be dedicated to the late William Herbert. His biography is being written by Mr. Arthington Worsley, and is almost completed. A general history of amaryllid breeding in England from Herbert's time to the present is also being prepared by Mr. Worsley and will be included along with the other features you expect each year.

This will be followed in 1938 by a volume dedicated to Mr. E. H. Krelage. He will contribute his autobiography, and will also be responsible for the symposium on continental European amaryllid culture which will appear in the same issue.

The 1939 volume will be dedicated to South Africa. The main features will be supervised by Messrs. Dyer and Compton. The 1940 issue will be devoted to Latin America, and the 1941 volume to Australia.

—HAMILTON P. TRAUB,
Editor.

July 14, 1936,
Mira Flores,
Orlando, Florida.

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Year Book Correspondence. Correspondence regarding articles and illustrations for **Herbertia**, the Year Book of the American Amaryllis Society, is cordially invited. The annual news-letter or articles from Corresponding Members and Regional Chairmen of Trial Collections should be forwarded, if at all possible, by April of each year, or earlier, depending upon the distance, so as to reach the editor in ample time for publication.

Manuscripts should be typewritten if at all possible and double spaced; photographs should have the name of the owner to whom credit should be given, and the subject, written on the back.

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very sincerely yours
Arthington Worsley.

A TRIBUTE TO ARTHINGTON WORSLEY

As long ago as the beginning of the century, when any discussion took place regarding amaryllids, the name of Mr. Arthington Worsley of Isleworth at once occurred to the mind. So well known had he become for the large number of wild species he had gathered together, for his knowledge of them, and for his skill in cultivating them, that he was, about that time, elected one of the small body of honorary members of the Royal Horticultural Society—an honour, bestowed upon only a very few distinguished horticulturists—and appointed a member of its Scientific Committee. He has been the man to whom one turned for advice on all questions concerning the identity, the mode of life and the cultivation of members of this group of plants—and his advice was always most generously forthcoming.

Some of the results of his study of the species of the family (which are often very difficult to define) have been given to fellow horticulturists in the Journal of the Royal Horticultural Society and elsewhere. His interest has been greatest with the plants of the family that occur wild, but it has not been restricted to these, as shown, for instance, by the fact that he has raised hybrid hymenocallis and hybrid nerines. As with most keen horticulturists, he has strayed at times into other paths, for he has written of conifers and Cornish gardens, of the flowering plants and ferns of Brazil, of the forests of Galicia, of garden cacti, and of such subjects as the cause of the limits of variation in plants.

The great regret of his fellow horticulturists is that his extensive and profound knowledge has not yet been embodied in a garden Monograph of the group to which he has devoted so much study.¹

Aberconway

¹Contributed by Lord Aberconway, President, Royal Horticultural Society.

LIFE AND CAREER OF ARTHINGTON WORSLEY AN AUTOBIOGRAPHY



ARTHINGTON WORSLEY
at the age of four years.

Born in 1861, his ancestors being Lancastrians who had settled in Yorkshire towards the end of the 17th century, Mr. Worsley has had varied experiences of life and work in many countries. In company with his brother officers, he was presented at the Court of St. James's in 1882 to the late King Edward (then Prince of Wales) by the Prince's brother, the late Duke of Edinburgh, during the Victorian reign. Many modern critics decry the Victorian era, but forget that Britain was then enjoying a golden autumn-time of prosperous years the like of which will never be again experienced by any Briton.

Educated as a Civil Engineer, he subsequently specialized in mining economics, and it was in pursuit of his profession that he travelled widely in Europe, part of Africa, and especially in Central and South America. It might be thought that horticulture and mining had little in common, but his experience was otherwise, for letters of introduction from the Royal Gardens, Kew, enabled him to visit places which would otherwise have proved difficult of access on account of political disturbances. Especially was this the case in Cuba just before the revolution of 1895, for the Captain General in command of the Spanish army gave him a free permit carrying immunity against any interference, and, in places, sent a guard of cavalry with him. The adherents of Sr. Maximo Gomez thought that this permit would not carry him far without trouble, so they presented him with another document from their side of the fence. Between the two he got all over the "island-continent" without difficulty.

By some good chance, his professional work took him to countries of great botanical interest, and transit delays often gave time for a hurried study of plant life in the neighborhood. For instance, in his visit to Cuba he found time to accompany the Russian Commission of Imperial Domains into the tobacco lands of the Vuelta Abajo; to make the acquaintance of the well-known American geologist—Clarence King—at his temporary home at Dos Bocas, near Santiago de Cuba; to spend some days on the sugar estates of San Augustin near Los Cruces, and to visit a N. American sugar estate near the bay of Cienfuegos in order to study the various methods of sugar production. He also visited and examined the important mineral areas carrying haematite, copper, manganese, and bitumen in the island.

After more than 5 years work with the Civil Engineering Department of the North Eastern Railway, at Darlington, he took up a position in York as chief of the Yorkshire Sanitary and Engineering Association and carried out many works of arterial drainage in flooded areas, and structural work of various kinds. He was a Founder-Member of the Institute of Fuel under the chairmanship of the late Lord Melchett. Led an expedition of four engineers to examine five bituminous shale fields of central and southern Spain, on which was issued the Worsley-Auden Report, and, following a second and more extended examination, Mr. Worsley issued a subsequent Report. In the *Chemical Age* he made a Report upon the Scottish Shale Fields in which the costs of operation were critically considered and subsequently affirmed.¹ In 1928 he was a member of the World Power-Conference, held at the Imperial Institute which was attended by representatives from 40 nations, and he was invited to join the Berlin Conference held in 1929. He addressed the former conference several times on the economics of power derived from bituminous shales, and from peat and lignites. He was reported verbatim in the Transactions of the Conference—a stupendous book costing £42.0.0. per copy.

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¹An abridged report appeared in *The Chemical Age* of 27/2/1926.

His memory of numbers was remarkable, and often held him in good stead. One day, in a merchant's office, he was presented with a great stone of some highly crystalized mineral and was expected to name it off-hand. Thinking it was possibly Kyanite, of which he remembered the determining basal angles of the crystals, he took paper and pencil, drew out a protractor on paper, marked off the determining angles, and verified the mineral in a few minutes. This mineral is always found associated with forms of mica, and no economic means of separation was known. Some of our leading grinding-experts gave up the problem as hopeless from an economic standpoint, but Mr. Worsley carried out tests under varying conditions and soon found a simple plan by which a cheap and practically perfect separation of Kyanite from Mica can be effected.

In the war time he examined the vast extrusive masses of pegmatite which outcrop in the far N. W. of Scotland. The importation of foreign pegmatite was no longer possible, and potash was needed.

The problem presented no mining difficulties but did present great economic uncertainties. He reported that the mineral could be obtained in quantity at a cost which showed a small profit, but that imported pegmatite was of a higher grade and of a more constant character. That this was a war-time proposition requiring either governmental assistance or a guarantee as to price over a long period, without one of which guarantees operation would involve undue risk upon Capitalists.

It was said that he had crabbed a payable national industry. But as no one has seriously undertaken the obtention of this Scottish mineral, this fact speaks for itself.

He was the author of many articles on economics—mainly in connection with minerals—in the London Daily Press, but more especially in the London technical journals—such as *The Mining Journal*, *The Chemical Age*, and *The Transactions of the Institute of Fuel Technology*, etc. Therein he treated at some length of Beauxite and of bituminous shales and coals of various classes; of the monetary confusion caused by demonetising precious metals, and gave two articles on the Royal Metals which created no little stir, (*Report of the Radium Sub-Committee, 1929*, *Empire Radium Deposits*, and *The Radio-active ores of Industrial Value*) which were followed up by articles in the *Daily Telegraph* of London in which Mr. Worsley proved that we were paying far too much for Radium up to hospital standard. His article on *The Silver Crisis* (30/10/26) caused that issue of the *Mining Journal* to become exhausted in a few weeks, but *The Coal Crisis*, published 3/9/27, did not seem to attract much attention at the time, although the British Government carried out the whole of his suggestions shortly afterwards. He also advocated in the *Mining Journal*, in February and March 1932, that attention should be paid to certain gold areas on the W. African Gold Coast, and much satisfactory development followed in the next few years.

Among unpublished works he wrote a treatise on High Grade Refractories.

He was the inventor and patentee of an electro-chemical bleaching process in which the instability of Hyposulphurous Acid was overcome, and did some research work for several parties, including the *St. John del Rey*, the *Mond Nickel Companies* and the *British Metal Corporation*.

In 1924 he had 3 mining reports due for presentation on the same day. To get them all ready he had to work 14 hours every day (including Sundays) for a fortnight. He did so, and presented them punctually. He promises not to do it again.

Some may think that, as narrated in this biography, he allowed his energies to spread over a field too wide for one man to traverse safely. But, if there is work wanting to be done which is being neglected, the temptation to do it is very great. So the writer will not now deign to offer any excuse for having strayed into such a wide field of work if he felt capable of adding anything useful to human knowledge.

LITERARY WORK

In his more leisure years he wrote several books and many articles which were published in England and in Hindustan. Philosophy, Horticulture, and Genetics were his main subjects, and he broke all Trade Union rules by acting at various times as Author, Editor, and Publisher. His principal books are *Concepts of Monism*, *The Persian Philosophies* (Synopsis), *Recognition*, and *The Prayers of Philosophers*. The first was reviewed by critics from all the leading countries.² His articles secured much publicity in the Press of Hindustan, and most serious new books dealing with Indian and Persian thought were sent to him for review. The natives of these countries are not to be treated as illiterates and fed with the trivialities in which many British reviewers indulge. To suit them one has to absolutely read the books before reviewing them. Hence the *Times of India* sent him Col. Syke's *History of Persia* for review, and the *Hindustan Review* sent Coomaraswamy's great work on *Buddha and Buddhism*, and Dr. Mercier's *New Logic*, etc.

As a lecturer, Mr. Worsley has not done much, for those interested in such subjects are too scattered to form a large audience at any one place. By request, he did read papers to the Staff of the Special Neurological Hospital at Tooting on Memory States, and subsequently his paper was published in essay form. He has lectured before the Royal Horticultural Society; the India Society of London, and also at the Conference Hall, Streatham, and elsewhere, and has often taken the chair at London University at Lectures given by strangers to the University. Among unpublished matter, he had interesting correspondence with Ernst Haeckel on Monism, and with Karl Schumann on the Cactaceae, receiving from Schumann presentation copies of the English translation of his works.

LOCAL GOVERNMENT DUTIES AND PUBLIC WORK

On his return from Central America in 1894 he made his home at Isleworth on the tidal Thames, married in 1900, and his wife and son are living with him. During this tour in 1893/4 he had spent some time in Caracas, where the protest of the British Government about the conduct of some Venezuelan police in the Yuruan district was causing much excitement. With his friend the late Prof. Ernst of the University of Caracas, Mr. Worsley had an opportunity of comparing the various maps of the Yuruan area, and, although they showed many discrepancies, he came to the conclusion that the Yuruan "outrage" took place in Venezuelan territory. On his return to England, finding that various *ad captandum* views were being expressed in the British Press, he expressed his own opinion at some length in the *Yorkshire Post*. Presently the late President Cleveland delineated the position of the United States of N. America and insisted upon the dispute being referred to arbitration. The war scare soon subsided, and in due course the arbitral commission, held in Paris, came to the same conclusion that Mr. Worsley had expressed.

Turning from international affairs to local matters, he was disgusted at finding that the tidal Thames was being treated as a drain by various local Authorities. This is the part of the Thames on which the citizens of London disport themselves, on which the great rowing contests of the world take place, and on whose banks thousands of visitors, artists, and pedestrians enjoy themselves. Pollution would render the Thames obnoxious instead of pleasurable to the people, and it did not seem the duty of anyone in particular to take up the cudgels on their behalf. So, as a village Hampden, he devoted himself to defending the river from misuse, and found support both locally and from the London County Council. Some success has already attended these efforts and some of the worst sources of pollution have been closed, but much still remains to be done in waking up the great Authorities and Government Departments concerned to a sense of their duties. The public soon recognized that something was astir, for the citizens of Isleworth and the local Press backed him up through thick and thin. When Middlesex County Council decided to dump down at Isleworth the great sewage works for all the

²Hindustan gave half-a-dozen Reviews in English, some of them 11 columns in length, and the Vernacular Press many others, some of which puzzled the translators sadly. A number of special Reviews appeared, that of Dr. Julius Goldstein in the *Frankfurter Zeitung* being noticeable.

County (except the Lee Valley) instead of taking the sewage out to the sea as the engineer advised, a great protest meeting was held in the neighboring borough of Twickenham. Mr. Worsley was voted into the chair, much to the relief of many local-government magnates for whom this position presented difficulties. Unanimity was reached in a protest resolution. And now, before the Mogden Sewage Works are finished, the London County Council propose to expend £50 millions in a great scheme to take all the sewage of the London and suburban area out to sea.

During the Boer War he was one of the founders of *The South African Conciliation Committee* under the chairmanship of the late Lord Courtney, and was put upon the Executive. The Committee was disbanded shortly after peace was declared, and its members experienced the gratification of having the program, for which they had struggled, substantially put into operation by the British Government. He also attended and spoke at various conferences, such as that held at Trinity College, Cambridge, in June 1912, by the Aristotelian Society and other bodies, on "Purpose and Mechanism," Mr. Worsley claiming that the nature of "Purpose" was unknown apart from mechanical response to excitation of some kind.

For some years, early in this century, he maintained at Isleworth, a Climatological Station of the 2nd Order, under the Air Board, and submitted comparative air temperatures taken on thermograph charts with synchronous thermometer records.

He has been elected Chairman at many public meetings in the Boroughs of Twickenham and of Heston-Isleworth, and has successfully placed arguments before the Ministry of Health's Commissions and those of the Middlesex County Council at many Public Inquiries. He was also mainly instrumental in drawing out a Petition to H. M. The King in Council for the autonomy of Isleworth. He was chosen as Chairman of the Isleworth Watch Committee on its formation, and has acted as such ever since. The Ratepayers' Association made him its Acting Chairman. The Isleworth Electoral Area its Councillor on the Middlesex County Council, which placed him upon its Parliamentary and other Committees, and he has been a Justice of the Peace for Middlesex since 1907.

All these offices eat away one's time, and when life is on the wane, duty calls upon one to complete much unfinished work, and time taken from one work and given to another results in increasing the number of unfinished things, not in completing any of them. For instance, the editorship of the Isleworth Ratepayers' Magazine is not work to which every one aspires, or would undertake, but it, also, takes away some days in every month. Still, it is clearly better to die in harness rather than to doze away the last precious years during which duty to one's fellows can be performed.

LEGAL TROUBLES

Having made a Report upon the Gongo Socco Mine in Brazil, he was compelled to take the matter into the High Court, where he obtained a verdict in his favour. In 1895, he made a new point in British Law on the subject of the termination of tenancies. His own notice being held, on appeal, by the High Court to be valid.

He wound up a Mexican Mining Company guilty of irregularities, and the High Court assented to the Liquidator he nominated.

He is still urging the claim of certain debenture-holders before the *Anglo-Mexican Claims Convention* for damage and losses to a Mexican Mining property during the revolutionary period. He also obtained a magisterial decision, against which no appeal was made, that the hybrid Ligurian honey-bee raised in an apiary on the premises of the owner was not, if a swarm strayed, liable to become the property of the finder as is the case with the endogenous British Black Bee.

ATHLETICS

In the field of athletics, Mr. Worsley was at one time well known, especially on the cricket grounds of England and Scotland. He was for many years captain of the North and East Ridings of Yorkshire and was also often captain of the Marylebone Cricket Club sides at Lords and met with a fair measure of success both with bat and ball. Gifted with more than the average of physical strength and endurance, on one occasion he bowled throughout the innings of the opposing eleven,

then batted throughout the innings of his own side and remained undefeated at its close. Other cricketers have done the same thing, but not many of them. While captain of the N. & E. Ridings of Yorkshire he brought out some young cricketers of great merit, such as the late Frank Mitchell and the late D. Hunter, who subsequently took their place in international cricket. Among celebrated players with whom Mr. Worsley often played long since were Richard Daft, A. N. Hornby, George Freeman, F. R. Spofforth, W. L. Murdoch, and W. G. Grace (with whom he played during 21 summers.) The writer once got together a splendid side to visit the United States, but some delay across the water in arranging the program caused the visit to be put off. He had his own views as to dietetic training, and always advised professional cricketers not to attempt it, saying that those who had to play for 5 consecutive months should only aim at retaining normal good health. He used to quote two maxims—"Rules are only useful for those who, without rules, would not know how to conduct themselves. To all others, rules are merely hindrances."—and another from the Chinese classics—"The men of old ate when they were hungry, drank when they were thirsty, and slept when they were tired."—but, he added, "the men of old were the wise men of old, not the fools."

He published a series of articles of "Cricket and Cricketers" from 1870-1931, and was well known in angling circles. He also wrote on inland fishery matters, and on the parasites of the Salmonidae, etc., in the *Fishing Gazette*, and presented specimens of marine fish and of their parasites to the British Museum of Natural History.

At local regattas on the tidal Thames he also won events in sculling and was the donor of a challenge cup for the Thames.

HORTICULTURE

Let us now leave such matters as have been narrated above, and turn to the amaryllids. For it is written in the Koran—"If a man has two loaves, let him sell one and buy a lily, for bread feedeth the body, but beauty nurtureth the soul."

It was not until some 40 years ago that Mr. Worsley was able to indulge to the full in horticulture. At Isleworth he had a garden of some size and was able to cultivate tender plants and bulbs. Very soon, fortified by the many bulbs which he had collected during his journeys in Venezuela, Central America, and Brazil, he had a collection of no little importance which he kept up until the great war. Lately he has been obliged to abandon the care of the major part of his collection, for the burden of taxation and the economic stress which has fallen upon us since then has quite defeated the efforts, or indeed the possibility, of most private individuals growing tender plants, or of spending their time in any other way than in striving to earn enough to pay the tax-collector. These are the labours of Sisyphus, endless in time and unproductive of any good results, for there is no limit to the extravagance and waste of Governments.

The really interesting point in the career of one who had many and varied interests, is,—what first drew his attention and devotion to the amaryllids? But here again we must give the same reply which inevitably follows every sort of inquiry seeking a solution in the inner core of things. *He did it because he couldn't help it.* One idle afternoon he strolled into a neighboring gardener's green-houses and there saw a lovely lady in the guise of a *Hippeastrum* in full glory. The die was cast. There could be no turning back, for beauty was awakened in the soul.³ He shows no sign of abandoning this love, and congratulates the Amaryllis Society in that the United States of N. America was the first country to realize that love of the amaryllids is a special cult appealing to those whose eyes are trained to beauty and symmetry. May it long flourish.

No one who has ever climbed in the Sierra from Petropolis, and seen *Hippeastrum procerum* at home, can forget the amazing beauty of the scenery, unmatched, probably, in this world (c. f. Monograph in Gard. Chron. of 4/5/29). If he does not then and there fall in love with the amaryllids, he should be provided with a

³Bacon said, in his Essays—"The mind of man is as a glass, eager to receive the image of the universe, joying to receive the signature thereof, as the eye is of light."



*Arthington Worsley
at the age of 29 years*

new pair of eyes. The writer made a special visit to Brazil to see this sight, and was taken round by his friend the late P. M. Binot. Since then, the scenery in other parts of the world seems commonplace. So one gains and loses at the same time.

Beauty, which fills the lover with delight, is a sense of accord, or reconciliation, between the divine within us and the divine without. The old Persian love story of Laila and Majnun is true for all time—"To realize the beauty of Laila one must look with the eyes of Majnun"—and never was this truth borne in upon the writer with such overwhelming assurance as when he spent those glaring August days in the Alhambra at Granada. Every niche and crevice, every detail of those wondrous ceilings and slender columns, was picked out in light or shade. One lived over again with the ancient Moors, loving just what they had loved, filled with the same admiration, falling into the same ecstatic condition of delight. Was one just living and looking back on the old times, or was one experiencing over again what one had loved long since. Was it cognition of beauty, or recognition? Who can say.

In 1899 Mr. Worsley found a complete cure for mildew on vines, by fine spraying with water at a temperature not much below boiling point. As this requires skilled application, the President of the Royal Domains of Germany thought that it would prove difficult to guarantee efficient application on a large scale in vineyards. But where properly applied on a small scale it proved a complete remedy in one or two applications.

He raised several new cross-bred plums and apples of proved value at Isleworth and also a hybrid sub-evergreen oak, and attended the Darwin Ceremonials held at Cambridge University in 1909. He often took the Chair at the dinners and meetings of the Horticultural Club, such as that on 21/10/13, when Professor Bottomley laid claim to certain advantages from using a specially prepared form of Peat, which claims Mr. Worsley held were limited, as he had carried out experiments with peat prepared in this way. He also took the Chair and spoke on 6/5/14 when the subject of the lecture and discussion was "Indian and Persian Gardens." He at times took the Chair at the Scientific Committee of the Royal Horticultural Society. He also lectured before the Royal Horticultural Society on 21/3/31 on "Amaryllis."

The late H. J. Elwes, of Colesbourne Park, Cheltenham, was a lover of amaryllids. One very wet day he came to see the Isleworth garden, and, showing some annoyance at the weather, remarked—"Well, we cannot see much to-day"—"Why not?" Mr. Worsley replied. "I have over a thousand paintings and drawings, mostly of amaryllids, which are ready for you in the library." He stayed so long examining them that he missed his last train. As the outcome of this visit he would have the writer publish a new work to be called *The Amaryllidæ Displayed*, with coloured figures of every typical species. On a fuller examination of the matter to be published, he realized how our knowledge of the *Amaryllidæ* had grown since Herbert's time, and that several volumes of great expense would be entailed in publication, if the whole ground was to be covered. So the R.H.S. took the matter in hand, but, at the time, the hypothecation of the needed funds presented difficulty as other work was already in hand. Moreover the number of members interested in amaryllids was limited, so the matter was not undertaken. The work would have included some 50 genera, and fully 100 typical plates would have been wanted. Then followed the death of H. J. Elwes, and the great war still farther increased the estimated cost of production. Since then no further project for publication has been put forward, and an opportunity seems to have slipped by. The collection of paintings and drawings has, however, been placed in security in London.

In the field of Genetics he opposed some of the earlier adherents of Mendelism, who, in his view, wished to push their theories farther than observed facts warranted, and criticised some of their statements before the Scientific Committee of the R.H.S.

He read a paper on his own observations on hybrids, showing that the changes from the parental types in first hybrids could not be brought into accord with recorded changes in crosses among mongrel plants, and that the Mendelian advocates were dealing exclusively with the latter crosses.

At the *Third International Conference* on Genetics, held in London in 1906—The late Professor Bateson in the chair—Mr. Worsley read a paper on "Hybrids among the *Amaryllidæ* and *Cactaceæ*," giving a list of 19 hybrids in each division, and discussing the observed mutations in the hybrid progeny of each of them. He also gave the observed colour changes in 45 cinerarias and in some *Gesneraceæ*.

At the *Fourth International Conference* (Paris 1911) he submitted a paper showing the results of 1181 inter-generic cross-pollenizations in the *Amaryllieae*, each of which had been effected on 5 or 6 separate flowers. The tabulated results showed that *Brunsvigia* and *Amaryllis*, *Vallota* and *Gastronema*, *Elisena* and *Hymenocallis* (*Ismene*), *Eucharis* and *Urceolina* and *Zephyranthes* and *Cooperia* had been reconciled. Some botanists complained that the author had often made use of sub-generic in place of generic names, but he had a good reason for exercising this distinction, for in not a few cases some sections of a genus are not fertile with other sections, and we have no proof that because *Elisena* will fertilize *Ismene* it must also fertilize *Hymenocallis* proper. Therefore such distinctions need to be maintained until our knowledge is more complete. Since 1911 some other sub-genera have been reconciled.

The raising of mongrel plants is a nurseryman's job, and the jumble of characters resulting has certainly given us many improved varieties, but has also in some genera—such as *Hippeastrum*—destroyed the individuality which is so delightful in a collection of species. With the exceptions of a strain of self-coloured ultra-marine cinerarias, which he perfected and fixed so that they came true from seed, and of a strain of gigantic bluebells of which he raised 6 generations of selected seedlings—the original strain of *Scilla Hispanica* having been given to him by the late John Weathers of Isleworth—Mr. Worsley devoted himself to inter-specific and inter-generic hybridization. This latter is very speculative work. Up to 1911 he had made some thousand cross pollinations, but had only obtained a few outstanding successes. The first, named *Ismene festalis* (*Elisena longipetala* x *Ismene calathina*), is now grown in most warm temperate countries, and is hardy on the coasts of the Mediterranean Sea. The second, *Ismene aurea* (*Elisena longipetala* x *Ismene Amancaes*), is not yet in general cultivation.

Among inter-specific hybrids he raised a splendid red-flowered *Crinum*, which the late W. Watson named "*Worsleyi*." [W. Watson in Gard. Chron. 2/2/01. p. 71.] This was a cross between *C. Moorei* and a Jamaican form of *C. scabrum*. Although when in a young state it grew vigorously, it became quite decrepit after flowering, and has died out of cultivation. When Mr. Watson first saw it in flower in 2/6/00, he took off his hat to it, saying, "This is a gentleman." Quite a number of hybrid crinums die out in our greenhouses. Dean Herbert gave a long list, none of which are now seen alive, but—"De Mortuis nil disputandum." Mr. Worsley also raised *C. giganteum* x *C. Moorei*, and *C. amanteum* (*C. giganteum* x *C. amabile*).

Among the nerines, Mr. Worsley raised hybrids on the little *N. pudica* and also on *N. corusca*. Subsequently he selfed both strains and raised several charming forms, but, recently, the public rage has been for size only, irrespective of brilliance of colour, and in this race after ugliness he will not compete.

His hybrids between *Brunsvigia* and *Amaryllis* have been so fully dealt with that they need not be referred to here. He also raised hybrids between *Zephyranthes Andersoni* and *Cooperia pedunculata*. These latter genera do not appear to be generically distinct, and should be joined up into one genus.

He was one of the judges at the International Show held in London in May 1912.

In 1900 he was elected as an honorary member of the Royal Horticultural Society and made a member of its Scientific Committee. He has been granted a First Class Certificate for:

1. *Brunsdonna Parkeri alba* (11/9/28) an albino of the 3rd generation.

The R. H. S. have awarded him also Awards of Merit for 9 plants.

2. *Ismene festalis*—a bigeneric hybrid—30/5/05 at Temple Show.
3. *Cactus Coopermanni*, a bigeneric hybrid—14/5/12.
4. *Brunsdonna Parkeri alba*—an albinoid sport—9/11.
5. *Brunsdonna blanda*—*Amaryllis blanda* of Herbert—11/9/28.
6. *Agapanthus inapertus*—1913.
7. *Cereus Ameicaensis*—1912.
8. *Blandfordia Cunninghamsi*—1913.
9. *Phyllocereus roseo-purpureus*—7/1930.

Numbers 1, 2, 3, 4, 5, and 9, were hybrids raised by Mr. Worsley at Isleworth, the others were grown by him from imported plants.

Although biographies are inclined to be heavy reading, the party whose deeds are delineated may have had lighter moods. In this particular case he found time for composing a few stanzas, and now that his life's work is nearly over he does not look back upon it with regret. He has no "back words" for anyone—they all did their best according to their lights—so he takes leave of his readers in this style and asks their pardon if he has wasted any of his time.

Do I repent that each succeeding sun
My lotted span of days remeasureth;
Do I repent, now many years are run,
That Honour's baubles flaunt not coming Death;
That in my heart, far from Fame's blandishment
Peace holds her court, and throned is Fair Content—
Do I repent?

PUBLISHED WRITINGS

In addition to the books, etc., mentioned in this biography, and excluding engineering and mining Reports furnished to various clients, Mr. Worsley was the author of the attached list of 50 writings on horticultural and botanical subjects, and also of 157 writings published in various journals, etc., consisting of Reports on Public matters (12); Histories and Monographs (6); Pamphlets and Reviews (6); Articles in Journals (52); Local Government documents and Reports (16); Transactions of various Conferences (8); and various publications (57);—making 207 with the horticultural publications. There are others which are not listed.

ARTICLES ON HORTICULTURE AND BOTANY

In book form. Paper cover. *The Genus Hippeastrum* (Wesley, London, 1896).

List of Amaryllideae, etc., gathered in Grand Canary, Cuba, Jamaica and Venezuela, (Wesley, London, 1900).

Stricklandia cucrosioides, with fig., Gard. Chron. 5/10/01.

Crinum Wimbushi and *Crinum Samueli* (*Sps. Novae*), Gard. Chron. 25/11/02.

List of Plants, etc., gathered near Petropolis and near Lisbon. (Journal R. H. S. 5/04).

List of Plants, etc., gathered near Land's End, Cornwall. (Journal R. H. S. 6/07).

Hybrids among the Amarylliae and the Cactaceae, Analytical charts, etc., (Genetics; R. H. S. 1906).

Hybrids among the Amarylliae, descriptions of 27 hybrids, lists of crosses, etc., (Gard. Chron. Jan. and Feb. 1901).

Anemone variata (Journal R. H. S. 7/09).

Amaryllis Parkeri (Journal R. H. S. 11/09).

Hybrids of Nerine flexuosa. Comparison of mutations among. (Journal R. H. S. 3/09).

The Genus Polianthes, with figure, formulae, and analysis. (Journal R. H. S. 5/11).

Variation as limited by the association of characters. (Journal R. H. S. 5/11).

Hippeastrum Forgetii (Journal R. H. S. 7/12).

Conifers in the lower Thames Valley (Journal R. H. S. 10/03).

Germination in Amaryllideae (Journal R. H. S. 4/03).

Germination in Amaryllideae with 3 figs. (Journal R. H. S. 5/04).

Bulb extension in Amaryllids (Journal R. H. S. 4/03).

Crinum amanteum (hybrid), *C. giganteum* x *C. Amabile*, Gard. Chron. 28/11/03.

Cereus Kewensis and *C. MacDonaldiae* (Journal R. H. S. 8/13).

Hybrids of Phyllocactus crenatus and Cereus grandiflorus. Parallel descriptions of *Cooperi*, *Wrayi*, and *Thomasianus* (Journal R. H. S. 8/13).

The Genus Agapanthus. Description of *A. inapertus* (Journal R. H. S. 12/13).

Forest trees of Spanish Galicia (Journal R. H. S. 4/14).

The Genus Veltheimia (Journal R. H. S. 11/14).

Tritonia bracteata (Gard. Chron.)

- Habranthus advenus*, Max., with fig. (Gard. Illustrated, 15/10/27).
Brunsdonna (Amaryllis) Parkeri, with fig. (Gard. Chron. Illustrated. 3/10/25).
Brunsdonna Parkeri, with another fig. (Gard. Chron. 14/11/25).
The Brunsdonnas (Journal R. H. S. Vol. LI. Part 1. 1926).
Nerine filifolia, with 2 figs. (Gard. Illust. 7/11/25).
Crindonna memoria Corsii (C. Howardii) Comparative descriptions of parents and hybrids, with fig. (Gard Chron. 1928).
Hippeastrum Arechaveletae with fig. (Gard. Chron. 7/28).
Hippeastrum barbatum (Gard. Chron. 7/28).
Nerine flexuosa (Gard. Chron. 1928).
Genus Lycoris. A garden review of (Gard. Chron. 1928).
Hybrid Cacti (Gard. Chron. 1928).
Colour variation in hybrid Cacti and other plants. (Gard. Chron. 11/28).
Amaryllis (Brunsvigia) Slateriana, with fig. (Gard. Chron. 12/1/29).
Seedling, Self-fertile, and Constant-cropping Fruit trees. (Gard. Chron. 12/1/29).
Garden Crinums, with 2 figs. (Gard. Chron. 23/3/29).
Hippeastrum procerum, with 4 figs.—a Monograph—(Gard Chron. 4/5/29).
Silver-leaf and Victoria plums (Times. 22/7/29).
Plants of the Cape Peninsular—a review of—(Gard. Chron. 26/10/29).
Nerine (Hort.) Attar, with fig. (Gard. Chron. 12/29).
Phycella bicolor, fig. (Gard. Chron. 12/29).
Amaryllis (Brunsvigia, and Crinum in part)—Lecture at R. H. S.—(Journal R. H. S. 1931).
Hardier Hippeastrums (Gard. Chron. 12/31).
Amaryllis Baptiste alba (Gard. Chron. 1933).
Habranthus Chilensis, fig. (Gard. Chron. 1932).
Pamianthe Peruviana, with 3 figs. (Gard. Chron. 25/4/36).

ERNST H. KRELAGE HONORED

“Having served as president of the General Bulb Growers’ Society of Holland since 1906, Ernst H. Krelage announced at the recent general meeting of the Society that he did not wish to be re-elected. Being already an honorary member of the Society, he was unanimously elected honorary president. The membership then presented to him his portrait painted by the famous Hungarian master, Mendlik, now living in Holland. Addresses in honor of the retiring president were made by the representative of the Minister of Agriculture, by the vice-president of the Society and by others, including Prof. van Slogteren who as president of the Nicolaas Dames Foundation, tendered Mr. Krelage the large gold medal for personal services to horticulture, an honor which had never been bestowed before.”¹

Under date of February 4, 1936, Mr. Krelage writes from his home, 6 Stolbergstraat, Haarlem,—“I am starting soon on a family visit to Java—Netherlands East Indies— At my present age of 67 years I cannot give a [finished] autobiography for the 1938 Year Book, but shall be pleased to send you some notes”.

¹Florists Exchange, February 15, 1936.

A TRIBUTE TO DR. HOLMBERG¹

Dr. Eduardo L. Holmberg, the author of the important monograph on *Amaryllidaceas Argentinas*, which appeared in 1905 in the *Annals of the Argentine Museum of Natural Sciences*, is an internationally known naturalist, and ranks as one of the greatest students of plant and animal life that South America has given to the world.

For several years he has been in complete retirement from all active work, and at the age of 83 years, is the venerable dean in Latin America, of the followers of Linnaeus, Darwin and the other intellectual giants working in biology for the last two hundred years. He is one of the last surviving members of that school of scientists who considers an encyclopedic learning as a necessity. Besides his vast fund of knowledge in the fields of zoology, botany and pedagogy, he is equally well versed in philosophy and literature.

He occupied himself principally with the different branches of the natural sciences, in particular with zoology and botany. He produced monographs in these fields of genuine merit. His study of the Amaryllidaceae was carried on while serving as director of the Jardin Zoologico of Buenos Aires. The monograph of the Argentine Amaryllidaceae is now out of print and copies are extremely difficult to obtain, except occasionally through dealers in second hand books in Buenos Aires.

In recent years, Dr. Holmberg suffered a long and serious illness, but is recently reported to be considerably improved in health.

THEODORE L. MEAD, IN MEMORIAM

Mr. Theodore L. Mead, of Lake Charm, Oviedo, Florida, passed away in his 85th year on May 4, 1936, at Fernald-Laughton Memorial Hospital, Sanford, Florida. He suffered a paralytic stroke at his home on April 22, and had been under treatment since that date. Funeral services were held in Orlando, May 7, and he was laid to rest in Greenwood Cemetery, Orlando.

Mr. Mead had lived a long, full and useful life, the details of which were recounted in the autobiography appearing in the 1935 Year Book which was dedicated to him. He was the venerated pioneer horticulturist and plant breeder of the Southeast and on the publication of his autobiography he received the congratulations of his many friends in the United States and abroad.

Always his home was the Mecca of plant lovers. Many will cherish the memory of a personally conducted tour over the Mead estate which is notable for rare plants, especially orchids, palms, bromeliads, caladiums, amaryllis, and cacti. He retained his personal charm and acute mental faculties until the last, and could give off hand the scientific name or breeding history of any plant on his grounds.

To a host of friends his passing will be a distinct personal loss. His contributions to the advancement of ornamental horticulture are of genuine merit, especially in the breeding of orchids, bromeliads, caladiums and amaryllis. On the basis of his work he holds an important place in the horticultural hall of fame.

¹Compiled from data furnished by Sr. Jose F. Molfino, Chief of the Laboratorio de Botanica, Ministry of Agriculture, Buenos Aires, and Sr. Salvador Siciliano, Secretary; and Prof. Martin Doello-Jurado, Director, Argentine Museum of Natural Sciences, Bernardino Rivadavia, Buenos Aires.

REPORT OF THE SECRETARY

The Year since the 1935 Year Book went to press has been an eventful one and one of steady progress in the "advancement of the amaryllids", with great promise for the future.

The membership has shown a healthy increase of interested new arrivals, and the addition of several new corresponding members in far lands has given the Society a truly international significance. Among the new countries now represented in our corresponding membership roll are Denmark, Finland, Canada, Brazil, Venezuela and India.

All corresponding members are respectfully requested to send in their contribution of an annual news-letter early in the year, so that the editor's task will be simplified. The corresponding members enrolled during the year are: Mr. Bengt M. Schalin, Jorvas, Finland; Sr. Joao Dierberger, Sao Paulo, Brazil; Dr. H. Pittier, Caracas, Venezuela; Mr. John Lotan, Hull, Quebec, Canada; Mr. O. Mohr, Glostrup, Denmark, and Mr. Sydney Percy-Lancaster, Alipur, Calcutta, India.

The Third Annual National Amaryllis Show of your Society was held in Orlando, Florida early in April, 1936 and proved a distinguished exhibition of the very highest quality. The Society was honored by having as chief judge for this show Dr. H. Harold Hume, Assistant Director, in charge of Research, of the Florida Agricultural Experiment Station, Gainesville, Fla., veteran botanist, horticulturist and author on these subjects. Details of this National Show will be found elsewhere in the Year Book.

There have been most creditable exhibits of choice hybrid amaryllis at a number of important flower shows in the United States during the year, notably at Palm Beach (Fla.) Flower Show in late February, where Mr. John T. Scheepers entered an outstanding display of hybrid amaryllis, mainly imported Dutch bulbs. The International Flower Show in New York recognized the growing popularity of Amaryllis by providing a new class of sizeable proportions for these blooms at the 1936 event in March.

The 1935 Year Book received a warm welcome and the highest praise of competent critics in all parts of the world of horticulture. I believe that the Year Book came to the attention of many thousands of interested persons through the medium of these notices, resulting in the enrollment of numerous members. The Society's annual is gradually taking its place as one of the foremost special plant publications, and is gaining worldwide recognition as a reference work of the utmost importance in its field.

The 1936 Year Book, which bears the title "Herbertia", for the first time, in honor of Dean William Herbert, pioneer in Amaryllid studies, will assuredly surpass its predecessors in all matters of style, interest of content, value of the research outlined and in the quality of the illustrations. It is a triumph of editorial skill and conscientious diligent supervision on the part of its editor, Dr. Hamilton P. Traub, the formative and guiding genius of the Society, whose keen, scientific mind and infectious enthusiasm are surpassed only by his modesty.

The trial collection of the Society has been favored with a number of important acquisitions during the year, which are listed in the report on that subject. Additional donations will be welcomed, and also good photographs of new or outstanding amaryllids in flower. Major Albert Pam of England has been particularly kind in this respect.

Three items from the trial collection have been made available to members in 1936, two *Zephyranthes* species and one hybrid of interest and desirable qualities. Other items will be made available for similar release when sufficient stock has been worked up.

The most pressing need of your Society at the present time is for new members, at least two hundred more members than our rolls now contain, to assure a continuance of the same fine quality of articles, printing, paper and illustrations in the Year Book. Prices along all these lines are increasing, and the outlook is for a considerably higher cost of all the services that go to make the complete Year Book, in future issues. Your Society was fortunate in being able to close its calendar year of 1935 with all accounts paid and the treasury "in the black" by a very small amount.

Your officers extend their sincere appreciation to all members and advertisers for making this possible.

Renewals of the "faithful" have been coming in with gratifying regularity in the present year and the secretary trusts that the members will continue their missionary work in the field of persons who might be interested in joining the Society. Gift memberships to plant-loving friends are suggested as most suitable and helpful.

The American Amaryllis Society is your Society and its possibilities of success and service are limited only by the cooperation it receives from the component members. Your officers have tried to make it a living, human organization, with fresh, forward-looking and progressive interests and aims. In this regard I would respectfully call your attention to the inspiring character of Mr. Arthington Worsley's life story, a refreshing picture of the well-rounded career of a gentleman, a scholar and a distinguished horticulturist, which opens this "Herbertia". It may well serve as an example to youth through the years to come. It is stimulating in its simplicity and modesty. Your secretary can only say that he regrets Mr. Worsley's excessively modest estimate of his horticultural achievements.

Faithfully,

June 3, 1936,
Lakemont Gardens,
Winter Park, Florida.

WYNDHAM HAYWARD,
Secretary.

NOTICE OF 1937 NOMINATIONS

To the members of the American Amaryllis Society:—

As provided by Article 5, Section 1, of the By-Laws of the American Amaryllis Society, which specifies that the secretary shall send to all voting members, not less than 90 days before the date of the annual election, a list of the offices to be filled, together with the names of those whose terms expire, this information and notice is hereby incorporated below, and same will take the place of a separate mailed notice to the members to this effect for 1937 elections.

<i>President</i>	MR. E. G. DUCKWORTH, Florida
<i>Vice Presidents</i>	} MR. T. H. EVERETT, New York MR. E. A. McILHENNY, Louisiana MR. FRED H. HOWARD, California
<i>Secretary</i>	
<i>Treasurer</i>	
<i>Director at large, for 3 years</i>	MR. WYNDHAM HAYWARD, Florida
	MR. RALPH W. WHEELER, Florida
	MR. AL. G. ULRICH, Missouri

Article 7, Section 1 of the Constitution, provides that any voting member may submit to the Secretary, not less than 60 days before the annual meeting, nominations for officers and directors. These shall be submitted to a nominating committee who shall select the candidates for the final ballot.

The annual meeting for 1937 will be held on April 14, being the second Wednesday of the month. Therefore the names of the suggested nominees must be submitted to the secretary before February 12, 1937.

April 23, 1936,
Winter Park, Florida.

WYNDHAM HAYWARD,
Secretary.

REPORT OF TRIAL COLLECTIONS COMMITTEE

During the season 1935-36 steady progress has been made in adding to the Society's collection of *Hemerocallideae*, *Alstroemeriaceae* and *Amaryllidaceae*. Members have been kind enough to share some of their rare species with the Society and these are being grown on for study, and identification in some cases. Later, when sufficient stock is available distribution will be made to members in the case of items not readily obtainable.

Seeds or bulbs for the Trial Collection should be sent to the Chairman of the Committee at Winter Park, Florida, or to the New York Botanical Garden, Bronx Park, Fordham Branch P. O., New York City, in the name of the American Amaryllis Society. The New York Botanical Garden is an official cooperating agency of the Society.

ACCESSIONS, JULY 1, 1935 TO MAY 30, 1936

A-32 *Zephyranthes simpsoni*. Pinkish-white flowering species close to *Z. treatiae* and native to South Florida. Grown from seeds collected by Dr. Hamilton P. Traub in Lee and Collier Counties, Florida. Partly distributed to members in 1936.

A-33 *Zephyranthes pulchella*. Species collected by Robert Runyon near Brownsville, Texas; a yellow-flowered species intermediate between *Z. texana* and *Z. longifolia*. Partly distributed to members in 1936.

A-34 *Zephyranthes* sp. Probably *Z. robusta*; seed and bulbs contributed by Mrs. Emma M. Foster, Covina, California.

A-35 *Beschorneria yuccaoides*. Seeds of this rare succulent type, formerly included in the *Amaryllidaceae*, contributed by E. O. Orpet, Santa Barbara, California.

A-36 *Cooperia* sp. White flowered species, probably new, from the vicinity of Angleton, Texas; foliage similar to that of *Z. longifolia*. Contributed by Dr. Hamilton P. Traub.

A-37 *Lycoris squamigera*. Wide-leaved type; contributed by Carl H. Krippendorf, Cincinnati, Ohio.

A-38 to A-46, incl. Contributed by Major Albert Pam, England.

A-38 *Hippeastrum procerum*. Rare violet-flowered species.

A-39 *Hippeastrum pratense*. Miniature type.

A-40 *Hippeastrum tucumanum*. From Argentina.

A-41 *Hippeastrum reginae*.

A-42 *Hippeastrum psittacinum*.

A-43 *Hymenocallis quitoënsis*.

A-44 *Pamianthe peruviana*.

A-45 *Cyrlota* (*Vallota* x *Cyrtanthus sanguineus*).

A-46 *Hymenocallis caymanensis*.

A-47 *Hippeastrum aulicum*. Contributed by Mr. E. B. Martyn, Government Botanist, Georgetown, British Guiana.

A-48 *Alstroemeria* sp. Red-flowered, contributed by Mrs. John H. Churchwell, Jacksonville, Florida.

A-49 to A-50, incl. Contributed by Major Albert Pam, England.

A-49 *Zephyranthes macrosiphon*. Large-flowered species from Mexico.

A-50 *Alstroemeria campaniflora*. Species collected by Major Pam in Brazil.

A-51 *Hippeastrum* sp. Possibly *H. rutilum*; contributed by Dean H. Asper, Concordia, Kansas.

A-52 to A-53 Contributed by E. O. Orpet, Santa Barbara, Calif.

A-52 *Haemanthus* sp. Identity unknown.

A-53 *Haemanthus coccineus*. (See also A-11, 1935 Year Book).

A-54 to A-60 Contributed by Dr. Hamilton P. Traub.

- A-54 *Zephyranthes tubispatha* from Utuado, Puerto Rico.
- A-55 *Zephyranthes carinata* from Utuado, Puerto Rico.
- A-56 *Zephyranthes carinata* from Dorado, Puerto Rico.
- A-57 *Zephyranthes eggersiana* from St. Thomas, Virgin Islands.
- A-58 *Zephyranthes tubispatha* from St. Thomas, Virgin Islands.
- A-59 *Zephyranthes biflora* from St. Thomas, Virgin Islands.
- A-60 *Hippeastrum equestre* from El Semil north of Ponce, Puerto Rico.

A-61 *Hippeastrum hybridum*; seeds, contributed by Mrs. E. M. Foster, Covina, Calif.

A-62 *Amaryllis belladonna*; Florida grown bulbs, contributed by John A. Springer, Orlando, Fla.

A-63 *Cyrtanthus* spp.; red and white; seeds originally sent by Mrs. J. W. Archbell, Unkomaas, Natal, South Africa, and contributed by Mrs. W. E. MacArthur, Jacksonville, Fla.

A-64 *Hymenocallis speciosa*; three seeds; contributed by Major A. Pam, England.

A-65 to A-66 Contributed by Mr. E. N. Blake, Laredo, Texas; seeds;

A-65 *Zephyranthes* sp.; yellow-flowered.

A-66 *Zephyranthes* sp.; white-flowered.

A-67 *Zephyranthes* spp.; mixture of bulbs, including *Z. ajax* and others not positively identified; contributed by Dean Asper, Concordia, Kansas.

A-68 to A-74 Contributed by Dr. A. B. Stout, Director of Laboratories, New York Botanical Garden, New York City;

A-68 *Hemerocallis* hybrid, *Vulcan*.

A-69 *Hemerocallis* hybrid, *Bijou*.

A-70 *Hemerocallis* *fulva rosea*.

A-71 *Hemerocallis* hybrid, *Midas*.

A-72 *Hemerocallis* hybrid, *Margaret Perry*.

A-73 *Hemerocallis* hybrid, *Lady Fermoy Hesketh*.

A-74 *Hemerocallis* hybrid, *Queen of May*.

A-75 *Hymenocallis tenuiflora*; 6 bulbs; contributed by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, U. S. Department of Agriculture. Stock originally from the Philippine Islands.

A-76 *Sprekelia* sp.; one bulb each of two types; contributed by Mrs. Emma M. Foster, Covina Calif.

A-77 *Nerine* sp. (near *Nerine falcata*, Baker); seeds; contributed by Mr. R. A. Dyer, Pretoria, Union of South Africa; "flowers pink in large umbels, bulb up to 2½"; originally collected in Brits District of Transvaal at 3,200 ft. altitude, by Mr. A. O. D. Magg, Jan. 14, 1935". Seeds sent to Society collected from plants in Pretoria, Feb. 25, 1936; received in Winter Park, Fla., April 22, 1936; seeds partly sprouted, planted at once.

A-78 *Crinum parvum*; bulbs contributed by The Lady Muriel Jex-Blake, Kenya Colony, British East Africa; two bulbs bloomed soon after planting with tiny umbels of pink-striped white flowers like a miniature "Milk and Wine Lily"; see also A-30, in 1935 Year Book.

A-79 to A-80 Contributed by Garfield Park, Chicago, Ill., Conservatory;

A-79 "*Hippecoris Garfieldi*"; listed as *Hippeastrum* (seed parent) x *Lycoris aurea* (pollen parent) selected lot of bulbs.

A-80 "*Hippecoris Garfieldi*"; listed as *Lycoris aurea* (seed parent) x *Hippeastrum* (pollen parent); three bulbs.

May 30, 1936,
Lakemont Gardens, Winter Park, Fla.

WYNDHAM HAYWARD,
Chairman.

THE SECRETARY'S MAIL BAG

One of the most charming exhibits at the Third National Amaryllis Show in Florida in April, 1936 consisted of two pots of *Hippeastrum rutilum crocatum*, dainty saffron-colored species of Amaryllis native of Brazil, entered by Mr. Frank Vasku of Winter Park. The flowers have a charm that is unsurpassed and in the opinion of some, unequaled by the best of the hybrids. The form and color are so pure and delicate.

Members residing in the vicinity of New York should take advantage of the opportunity of viewing the experimental planting of new and old Daylilies on the grounds of the New York Botanic Garden in Bronx Park. Dr. A. B. Stout, leading Hemerocallis breeder of the United States, is director of the laboratories at the Garden. The show lasts from May to September inclusive.

One of the most difficult things to obtain is a good Amaryllis photograph. In fact taking a photograph of any Amaryllid seems to be fraught with many difficulties before a satisfying and life-like picture is achieved which will stand the acid test of reproduction by engraving in the Year Book. The Amaryllids seem to have more character as flowers than other families of plants, and they either "take a good picture" or they don't, usually they do not. In the Year Book the standard of illustrations is set as the best possible under all circumstances. Members having photographs of new and rare Amaryllids are urged to send them in for possible use in future "Herbertias". They should be original and never before published.

Mr. Thomas H. Everett, horticulturist at the New York Botanic Garden, and recently elected a Vice-President of the Society, visited the Society's secretary at Winter Park, Fla., with Mrs. Everett for a day in December 1935, and was also shown over the Amaryllis propagating house and growing fields of Mr. I. W. Heaton, at Orlando, Florida. Mr. Everett evinced much interest in the newest developments of the vegetative propagation methods as applied to various Amaryllids.

The *Cyrtanthus* species are getting a little closer to our vision. They are becoming more common in the rare plant and bulb nurseries of the United States, and apparently thrive under similar conditions to *Zephyranthes*. *Cyrtanthus sanguineus* has red flowers like a tiny Amaryllis, and most of the other species have tubular pendulous flowers. They are due for a rise in popularity, as are the nerines. Half a dozen species are now available, but they are still very rare.

Miss K. Stanford, a new member from South Africa, and a prominent seedswoman, will make a lecture tour of the United States during the summer of 1936, speaking on "South African flowers," under the auspices of the National Council of State Garden Clubs.

Mrs. Jerome W. Coombs, of Scarsdale, N. Y., member of the committee in charge of preparing the new booklet on "Judging the Amateur Flower Show," published by the National Council of State Garden Clubs, Inc., 30 Rockefeller Plaza, New York, N. Y., sends the Society a copy. Mrs. Coombs is a member of our Society and a sincere Amaryllid enthusiast. She recently returned from a South African garden exploration trip, and has an interesting article on the subject in this Year Book. The judging booklet has a page devoted to the Amaryllis standards of our Society.

The late Henry Nehrling's book "Die Amaryllis", published in the German language, Berlin, 1909, and the outstanding monograph on the *Genus Hippeastrum*, is still available in print from the publishers, Paul Parey, Verlagsbuchhandlung, Hedemanstrasse 28-29, Berlin, SW. at a price of less than \$1.00.

Mr. John T. Scheepers of the Fifth Avenue firm of John Scheepers, Inc., leading retail bulb specialists, has been appointed chairman of the membership and exhibition committees of the Society. Mr. Scheepers has probably done more than any other person in recent years in the importation of fine European types of hybrid *Amaryllis* for exhibition purposes and private collections. He is also prominent in the affairs of the New York Florists Club, the Horticultural Society of New York and is a member of the International Flower Show Committee which supervises the holding of the great spring exhibitions in New York City.

The Las Positas Nursery of Santa Barbara, Calif., Mr. Wm. R. Dickinson, owner, has gone in for nerines, hybrids and species, and will have a stock worked up in another season or so for commercial distribution.

The Federated Circles of the Garden Club of Jacksonville, Florida made a feature of Daylilies (*Hemerocallis*) at their annual Flower Show on April 30, 1936. Numerous interesting large-flowered and dwarf types were on display. Several of the *Amaryllis* Society's most active members reside in Jacksonville.

All members in the Pacific Coast area should make an attempt to attend the Fourth Annual National *Amaryllis* Show in Southern California in the spring of 1937. The Show will be held in the vicinity of Los Angeles. Details may be obtained late in 1936 from Mr. Fred H. Howard, managing director, at Montebello, Calif. Mr. Howard is a vice president of the Society, and a noted rosarian and *Amaryllis* breeder.

Many *Amaryllis* growers, amateurs and professionals, complain of their troubles and trials with the "pure white" hybrids. For some reason, perhaps being pure albinos, these are constitutionally weaker than colored types of hybrid *Amaryllis*. However, we have the following notation from J. W. Byrnes, in charge of the U. S. Department of Agriculture greenhouse collection of *Amaryllis* at Washington: "We find that pure white bulbs are weaker and are a little slower coming into bloom. We have no difficulty flowering them in two years from seed." That speaks well for the cultural methods of Mr. Byrnes, judging from the writer's experiences with several hundred seedlings from "pure white" seed.

The Society's corresponding member for England, Major Albert Pam, a banker in private life, made a flying trip to the United States in the Fall of 1935, and among other places visited the private horticultural show places of two members of the Society, Mr. Clarence McK. Lewis, New York City and Mr. Pierre S. du Pont, Wilmington, Del.

The Horticultural Society of New York, of which Mr. Henry F. du Pont, Charter Member of the A. A. S., is President, will hold its 29th annual Autumn Exhibition at the American Museum of Natural History, New York City, November 5th to 8th 1936 inclusive. *Amaryllid* fans should notice Class 14, for Nerines, "collection to cover 50 square feet."

We have the following note from Mr. Robert T. van Tress, Horticulturist of the Garfield Park Conservatory staff, Chicago, originators of the "*Hippecoris Garfieldi*," described elsewhere in this annual: "We are carrying on further hybridizing experiments and have at present some seedlings of a cross between *Hippeastrums* and *Clivia*, and another cross between *Hippecoris* and *Sprekelia formosissima*". When these flower we shall look forward with interest to receiving Mr. van Tress' report on them. There is apparently a greater affinity of genera and consequent greater possibility of bi-generic hybrids in the *Amaryllis* Family than had been believed.

Characteristic of the great difficulty in obtaining authentic information and plant specimens from some districts in South America is the following quotation from a letter by an American Consul in a South American country, relative to obtaining a list of the bulbs of the Amaryllis Family native to that country: "Although no efforts have been spared to secure information from the Department of Agriculture, it is evident that no botanist or nursery specialist in the government's service can give the desired data on the subject." Therefore the Society particularly urges persons in close touch with the situation to give their cooperation with these problems. We need complete lists of the Amaryllidaceae and Alstroemeriaceae native to Colombia, Bolivia, Chile and Brazil.

Dr. A. B. Stout, the Daylily authority of the New York Botanical Garden, has loaned us color paintings of his new varieties, "Charmaine" and "Theron", being the best of the rosy-pink and the purple black types respectively, of the Hemerocallis novelties of his breeding that have been named to date. These are not yet released commercially, and from the interest already evidenced in them, there will be a colossal demand for them when they are finally ready for sale. In daylilies "the first hundred plants are the hardest." A faster method of commercial propagation will be most helpful.

"I am very interested in the Amaryllidaceae," writes Mr. S. Percy-Lancaster, Secretary of the Royal Agri-Horticultural Society of India, from Calcutta, where he has become the Society's newest corresponding member. However he adds "Here in India there are no keen gardeners who care for any but the temporary annual flowers and a few shrubs". Mr. Percy-Lancaster is the son of the Mr. Lancaster who sent a collection of crinum species to Theodore L. Mead of Oviedo, Fla., many years ago (see Mead Autobiography, page 20, 1935 Year Book). He promises to send the Society some of his *Cooperanthes* bulbs for distribution (*Cooperia* X *Zephyranthes* hybrids).

". . . I am having some fun and am selling some bulbs so I can keep on raising more and can select out the best to keep," writes member Hermon Brown from Gilroy, Calif., (March 3, 1936) and apparently Mr. Brown has the right idea. The enjoyment is the main thing in raising Amaryllids, in private or business life.

"*Haemanthus König (King) Albert* holds its leaves until about January or February," writes C. W. Codwise of Bonita Springs, Fla., "and starts new growth about April 1st. The bud and leaves appear together, the former a little in advance. The large bulbs make one or two offsets a year, and one or two seeds, which are of slow growth. The flower ball is about 8 inches in diameter and very striking, and lasts about two weeks from the first flush. I have to tie them up in the rainy season as they are somewhat top-heavy with their handsome foliage." He adds that blooming size bulbs run from 2½ to 4 in. diameter.

"Amaryllis are being forced in small quantities (in Holland) and are often sold directly to the retailers from the grower," Mr. O. Mohr, of Glostrup, Denmark, informs us, in describing a survey of the winter flower markets of Holland that he made during the season just past. Mr. Mohr is one of the most progressive growers of cut flowers in northern Europe and is corresponding member for Denmark.

For those Amaryllid enthusiasts who find the gorgeous hybrid Amaryllis a little too gorgeous, or not sufficiently intimate, the writer can recommend wholeheartedly two dainty small-flowered Amaryllids that are most charming and intimate, if any bulbs can be that. These are *Leucojum vernal*, the spring snowflake, and *Cyrtanthus lutescens*, one of the Ifafa Lilies of South Africa. The flowers of the *Leucojum* are miniature drooping "bells," one or two to the scape, with green dots on the outside petal tips. The *Cyrtanthus*, apparently, will come to rival the *Zephyranthes* in popularity when better known. *C. lutescens* has tiny tubular

flowers that are pendulous and utterly intriguing. The color is yellow to deep yellow with a cast of orange.

Members of the Society are earnestly requested to renew their subscriptions early in 1937 and take no chances of missing the 1937 "Herbertia", which even at this distance gives assurance of outstanding interest. It will be the issue of issues, devoted to the foundation work of Dean William Herbert with the Amaryllis Family. The 1937 Year Book will mark the centennial of the publication of his famous monograph on the "Amaryllidaceae," now a very rare work. On the continued, and better still, increased support of the members and advertisers will depend the size and format of your Society's issue of "Herbertia" next year (1937). Your generous subscription will help do honor to the original Amaryllid enthusiast. We still hope to have an original colored plate and a cloth binding for the 1937 issue, but this will depend on the response of the membership.

Mr. Ellsworth P. Killip of the Smithsonian Institution, Washington, D. C., has prepared a monograph on the *Genus Bomarea*, sister group of the *Alstroemerias*, and one of four genera in the *Alstroemeriaceae* (see Hutchinson, page 74, 1935 Year Book.) This is a group of considerable botanical and horticultural importance, especially cultivated in greenhouses in England and on the continent, but little known in the United States. English nursery catalogues offer several varieties. The plants are mostly climbing herbaceous perennials and will be more generally grown when better known. Mr. Killip's paper is of technical nature and is awaiting publication. The officers of your Society regret that the financial resources of this organization do not as yet permit us to sponsor the printing of such worth-while monographs as special publications apart from the Year Book. With the aid of special donations this would be possible, and any members willing to undertake the expenses of such an enterprise are invited to communicate with the Board of Directors through the Secretary. It is hoped that a special fund may be inaugurated in a few years for this purpose. The cost of such a publication as Mr. Killip's monograph would probably be between \$300 and \$500. According to Dr. Alexander Wetmore, Assistant Secretary of the Smithsonian, Mr. Killip's monograph would run to about 75 pages of matter similar in make-up to the "Contributions from the United States National Herbarium."

"I realize", writes Dr. Freeman Weiss, Senior Pathologist of the United States Department of Agriculture (March 22, 1936) "that Amaryllids have pathological problems and that these are not now receiving any scientific attention. There is, of course the well known rust or red spot, (Dr. Weiss' article, 1934 Year Book) but in addition I have seen a root rot and at least two kinds of bulb rots. These troubles may result from mismanagement, but it is often the case that new plant cultures which appear very free from pests and diseases at first, become more and more prey to such as their range of culture is widened and intensified."

The Society is gradually bringing to light old time publications and monographs on Amaryllids. In 1936 we received from Mr. Cecil Houdyshel of LaVerne, Calif., the "Amaryllis Number" of the late John Lewis Childs' magazine,—"The Mayflower," which was published in 1904, and also the 1909 "first and last" Luther Burbank Amaryllis Catalog, from Mr. J. B. Pettit, of Fruitland, Ontario, Canada, postmaster of that town and Amaryllid fancier of many years. What forgotten or neglected publications will it be in 1937?

With the steps already made and the progress going on all the time in *Hemerocallis* breeding, one hardly knows what to expect next. Out of Dr. Stout's laboratory have come some amazing varieties, and the end is not yet. There are *Theron* and *Charmaine*, not to speak of *Vulcan* and Dr. Stout writes that there are still better ones on the way. The very latest is bicolored Daylilies, with alternate petals and sepals in light and dark colors. We draw attention to an excellent article by Mrs. Thomas Nesmith in the June, 1936 House & Garden,

entitled "Daylilies", and Dr. Stout's note in the same number with a picture of one of the new bicolored types. Garden lovers with the inclination should secure the new varieties to keep up with the advances in this wonderful group of plants.

Sr. Joao Dierberger, Jr., a member of the firm of Dierberger & Cia., Rua Libero Badaro, 20, Sao Paulo, Brazil, the foremost nursery, seed and landscaping firm of Brazil, visited the "Herbertia" editor, Dr. Hamilton P. Traub at Orlando in November, 1935. Sr. Dierberger, whose father organized the firm bearing the family name, is a brilliant young horticulturist who has done much for the advancement of horticulture in his native country.

Mr. I. W. Heaton reports that the stock of hybrid Hippeastrum, *War* (Heaton, 1934) has been sold to Max Schling, New York and that the name has been changed to *Mephisto*.

June 1, 1936
Lakemont Gardens,
Winter Park, Florida.

WYNDHAM HAYWARD,
Secretary.

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1936-37

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** Deceased October 1935: membership continued in his memory by his mother, Mrs. H. S. Nicholson, Fort Lauderdale, Florida.



John Scheepers

Scheepers White Hybrid Amaryllis

Leopoldi type B, pure white with light greenish markings in throat, flowers 8" diameter; exhibited at the Spring Flower Show at Aalsmeer, Holland, 1936.



H. King, Pretoria, Union of South Africa

Cyrtanthus Balenii Phillips

"The coral red flowers of this species may be found in profusion during mid-winter near St. Lucia Bay, a 'wild' area of the east coast of South Africa. The bulbs flower fairly regularly in shallow pans at the Division of Plant Industry."
—R. A. DYER.

1. REGIONAL ACTIVITIES AND EXHIBITIONS

AN INTRODUCTION TO THE SOUTH AFRICAN AMARYLLIDACEAE

R. A. DYER, BOTANIST,
Division of Plant Industry,¹ Pretoria

The importance of climatic and soil conditions in the cultivation of bulbs has been stressed repeatedly. Both factors vary considerably in different parts of South Africa; for instance, the south western Cape has the rainfall restricted largely to the winter months, whereas this condition changes progressively to a summer rainfall as one advances into Natal, the Orange Free State and the Transvaal. In some localities in these areas the annual rainfall may be 30-50 inches, while in Namaqualand it may be as low as 3-5 inches per annum. Soil and other habitat conditions also vary considerably. Many places are eminently suited to the cultivation of exotic species of Amaryllidaceae such as the *Hippeastrums*, but as far as I know, few if any of these, play an important part in the horticultural trade of this country. On the other hand, largely due to this wide range in habitat conditions, South Africa has been endowed by nature with a very rich flora in which Amaryllidaceae occupy an important position. Many of them were introduced to European gardens during the 17th and 18th centuries. Some belonging to the genera *Nerine*, *Haemanthus*, *Cyrtanthus*, etc. have remained favourites ever since. Enthusiasm for their cultivation locally increases annually. It is not surprising, therefore, that attention in this country has not been directed more extensively to the science of hybridisation.

The following notes on Amaryllidaceae in South Africa are of necessity very incomplete. The wealth of species will be appreciated by a study of the list compiled by Prof. R. H. Compton, Director of the National Botanic Gardens, Kirstenbosch, and published elsewhere in this volume. At various times recently I have made notes on different species and, when looking over them, I found that most of those I had referred to, had been figured in "Flowering Plants of South Africa." It then occurred to me that this publication might well be available to readers in some convenient library and by consulting it, those interested would find not only beautiful coloured plates but also detailed descriptions and distribution records. This then is my reason, and apology if need be, for the numerous references to this publication, which for brevity have been placed in brackets, thus [t.511] denoting coloured plate No. 511 in "Flowering Plants of South Africa."

The whole of part 1 of Vol. 15 (1935) was devoted to *Nerine* and five of the ten species enumerated were classified as new species, namely: *N. Peersii*, *N. alata*, *N. tulbaghensis*, *N. Breachiae* and *N. filamentosa*, all figured and described by Miss W. F. Barker. The others were *N. flexuosa* Herb., *N. humilis* Herb., *N. Krigei* Barker, *N. filifolia* Baker var *parviflora* Barker, *N. Masoniorum* L. Bolus. While opinions may differ on what plant-forms are or are not worthy of specific rank, it does not detract from their respective horticultural merits. *N. Bowdeni* Watson has proved one of the most successful parents in hybridisation experiments in England on account of its more hardy nature than other Cape species. This inherent quality is no doubt due to the fact that in its native habitat it is subjected to severe frosts and occasional snow during winter. An outstanding species of *Nerine*, closely allied to *N. lucida* Herb. (t. 134) and *N. falcata* Barker, a strong growing pink species (t. 511), occurs in countless thousands in some unfrequented open plains of the Transvaal. A number of the bulbs were brought to Pretoria during 1935 and after one season's cultivation the size of the umbel has increased appreciably. Whether it has potential value for hybridisation remains to be proved, and it is hoped to supply the experimental garden of this Society with bulbs at a later date for such trials. The genus is further illustrated under t. 132, *N. Frithii* L. Bolus and t. 355, *N. sarniensis* Herb., the most widely known species and one of the most handsome.

¹Dept. of Agriculture and Forestry, Union of South Africa.

A very closely related genus to *Nerine* and nearly as attractive, but not so well known in horticulture, is *Hessea*. Generally speaking, specimens of *Hessea* are not so abundant as those of *Nerine* but during February of this year what is considered to be an undescribed species was collected in the eastern Transvaal and brought to Pretoria with the information that its flowers transformed an area of grassveld into a sea of deep pink. The delicate species *Hessea Rehmanni* Baker (t. 120) has since been transferred to *Nerine* by Mrs. L. Bolus. The two genera are distinguished mainly by the character of the anther attachment, whether basifixed (*Hessea*) or dorsifixed (*Nerine*). Further the perianth segments of *Nerine* are usually longer, narrower and crinkled along the margin. Other species of *Hessea* figured are *H. Zeyheri* Baker (t. 43) and *H. Mathewsii* Barker (t. 404).

Buphane disticha Herb. is one of the most widely spread species in Southern Africa but never found in mass formation as is often the case with others. It occurs in grassveld areas of high rainfall in the Transvaal and Natal and extends into some karroid areas of the Cape with a relatively low rainfall. The bulb is very large, very thickly protected by the dry remains of leaf bases, and usually partly exposed above ground. Annually, after the flowering period in early spring, two opposite series of leaves grow out in a unique fan formation. The plant has an historic interest also in that it contains a most potent poison, one of the ingredients of Bushmen's arrow poison which caused the death of many an early explorer. On account of this, *Buphane disticha* soon received the common name "gifbol," meaning poisonous bulb. Even at the present time it figures occasionally in court cases of native poisoning and in murder charges.

Ammocharis falcata Herb is another species with a wide distribution according to the existing classification. Some doubt has arisen as to whether it is one and the same species which extends from the drier areas of the Cape into the Orange Free State, Bechuanaland and the Transvaal. Dr. H. G. Schweickerdt, South African botanist, temporarily stationed at Kew, is accumulating data to elucidate this problem. The bulb is very large and produces annually a number of opposite, falcately spreading leaves. The large umbel of bright pink flowers compares most favourably with the larger species of *Brunsvigia*. Seed sets freely and, owing to its water content, germinates almost immediately after bursting from the capsule. For this reason it is problematical whether the seed survives a long sea voyage. Although I have no information on the number of years which elapse before seedlings flower for the first time, I have little doubt that it would be considerably more than for species of *Nerine*, all of which have considerably smaller bulbs.

With regard to *Buphane disticha* and *Ammocharis falcata*, a description of the former appeared under t. 230, but the coloured illustration of the latter was inadvertently placed with it.

Most species of *Crinum* share the horticultural disability of a protracted juvenility. Were it not for this *C. crispum* Phillips, a new species described in 1934, (t. 532) would soon gain widespread popularity. It grows abundantly in some unfrequented parts of the Waterberg and Pretoria districts and is attractive both for the beauty of its large, white or pale pink flowers, and for the unusual "crisped" leaves. A near ally of this is the widely distributed *C. longifolium* Thumb. *Crinum campanulatum* Herb. a species of exceptional beauty, is found abundantly in inland depressions, near Grahamstown, which during the rainy season, become "vleis" (small lakes or ponds). At this period the plants flower, and later when the vleis usually dry up and the soil bakes very hard, the leaves die down and the bulb enters a resting period. So far as I know, it has done poorly under cultivation, except when grown in permanent water.

Cyrtanthus, another typical South African genus, is well represented in "Flowering Plants of South Africa": we have *C. contractus* N. E. Br. (t. 4), a species very closely related to *C. angustifolius* Aiton, which occurs occasionally on the stony and grass covered hills near Pretoria. *C. rotundilobus* N. E. Br. (t. 37) is a smaller species from the grassveld between the Cape and Natal. In the same volume one finds the better known and far more handsome species, *C. sanguineus* Hook. (t. 25) and *C. obliquus* Ait. (t. 35), both from the eastern Cape, the former favouring fairly dry but protected conditions in coastal bush, whereas the latter flourishes in open, often stony grass country. *C. McKenii* Hook. f. (t. 33) originates from temperate situations along river banks in Natal. More recently there have appeared

C. Galpinii Baker (t. 159) and *C. Balenii* Phillips (t. 343), two rather similar species with one medium-sized flower. Trials might prove them of considerable merit. *C. helictus* Lehm. (t. 99) resembles the above two species and would have been an established favourite in gardens many years ago were it not for the difficulty experienced in cultivation. It inhabits areas in the eastern Cape subjected to extreme conditions of heat and drought, the bulbs being found under the protection of small shrubs. In contrast to the requirements of *C. helictus*, *C. Huttoni* Baker from the same geographical region is restricted to moist, shady cliffs, where the scarlet flowers make a pleasing sight overhanging the road up the Katberg Pass. *C. flava* Barnes (t. 559), with yellow flowers, is the smallest known species in the genus and has been recorded only from the type locally near Grahamstown. It was described first in 1931 in "South African Gardening and Country Life" by Miss Barnes. *C. collinus* (t. 211) is a rare species from the Cape similar to *C. angustifolius*.

The beauties of the bright yellow flowers of the endemic genus *Anoiganthus* represented by the two species *A. breviflorus* Baker (t. 144) and *A. luteus* (t. 539), seem to merit greater attention than they appear to have received. The former is widely spread in marshes at altitudes usually over 2,000 ft. in the eastern Cape, Natal, Swaziland and adjacent territory, whereas the latter is found in the grassveld of Natal below 2,000 feet.

The value of *Haemanthus Katherinae* Baker (t. 136) as a decorative pot plant has been emphasised by other writers and there is no need for repetition. In contrast to the open inflorescence of this species, *H. natalensis* Pappe (t. 32) is one of a larger section with a condensed pin-cushion-like umbel. Both species mentioned may be found under the protection of woods in Natal.

H. sacculus Phillips (t. 531) from the Transvaal has an "open" inflorescence and is the equal of *H. Katherinae* in beauty and would probably respond well to similar methods of cultivation. Some of the pin-cushion type, such as *H. magnificus* Herb, are no less handsome, whereas *H. albiflos* Jacq. (t. 190) is a relatively unattractive example.

Genera such as *Gethyllis* and *Apodolirion*, represented by *A. MacOwanii* Baker (t. 533), are of morphological rather than horticultural interest. The solitary flower, although beautiful, is very fugacious; the young ovary is subterranean but as it matures it is pushed up from below and ripens above ground, giving off a sweet aromatic odor.

The acceptance of Dr. J. Hutchinson's classification of the Monocotyledons (1934) enriches the Amaryllidaceae in South Africa by the two genera *Agapanthus* and *Tulbaghia* at the expense of the Liliaceae. Early botanical writers described about eight species of *Agapanthus*, but Baker in Fl. Cap. Vol. 6, page 402 (1897) classified all known forms under the one name *A. umbellatus*. This name, however, has to give place to *A. africanus* Hoffm. which has priority according to International Rules of Nomenclature. Incidentally it was the first plant figured in "Flowering Plants of South Africa". Due to the energies of several collectors within recent years, material from various localities has been accumulated at Kirstenbosch. In the March number of "South African Gardening and Country Life" (1934) Miss Leighton published a short account of the genus. Some of the old names were resuscitated and some new ones added, making a total of eight species recognized at the time with the prospect of more to follow. To impart to readers a more graphic impression than I can give of the beauty of *Agapanthus*, I quote from an article by a different author which appeared recently in the periodical mentioned above. "Our *Agapanthus*—It grows at its best in the shadows of the kloofs and krantzies of Natal and among the rocks beside the loitering streams. Celestial things borrowing their raiment from the silver blue of summer skies".

Species of *Tulbaghia*, when viewed as individuals, are rarely what might be termed "showy" and to produce an attractive display require to be grown in quantity. *T. fragrans* Verdoorn (t. 438) with an umbel of 30-40 flowers, is probably the most attractive member of the genus and has the additional advantage of a pleasant scent. It was described and figured for the first time in 1931 from material collected in the Lydenburg district, Transvaal. This is another "subject" which I hope to introduce to members of the Society through the experimental garden. It is most nearly allied to *T. violacea* Harv. (t. 9), which, however, has the characteristic garlic smell.

In this brief introduction to Amaryllidaceae in South Africa, many interesting species have escaped mention, outstanding examples being *Vallota speciosa* Dur. and Sch., *Amaryllis Belladonna* Linn., *Brunsvigia* spp. and *Clivia miniata* Regel. (t. 13) During the past six years or so Miss G. Blackbeard, of Grahamstown, has been using the last mentioned species in hybridisation experiments with very promising results. It is intended to refer to her work in the next Year Book, by which time also, I hope to have gathered more information relating to horticultural activities with Amaryllidaceae in this country.

SOUTH AFRICAN AMARYLLIDS

MRS. JEROME W. COOMBS, *New York*

During a trip to South Africa in 1934, I saw in flower many representatives of the Amaryllis Family. South Africa has a great abundance of amaryllids, an abundance in which we have been slow to claim a share. They are plants, too, which almost without exception, may be grown well in this country, out of doors in the south and the warmer parts of the west, in greenhouses and sunrooms in the north, sometimes as summer bulbs. Many will bloom on window-sills.

Freesias of the Irid group have been grown commonly for years. These other South Africans will generally need only the same treatment and will bloom as easily. Many are grown successfully already but they should be much better known. Their principal need is a long rest after flowering under entirely dry conditions. This is very important.

When grown in the colder parts of the country in pots, they will not, as the Tulips and Hyacinths do, need the weeks in a cool dark place for root-making. They start growth at home generally when the rains give them their signal. They need only heat and water to begin their growth. Some of them, possibly, may be slow about blooming but once established, no flowers could be more faithful. Year after year they will produce their lovely, often fragrant blossoms in the same pot. I happen to know of one pot-grown bulb of *Crinum Moorei* which has sent up its stalks of white and pink fragrant lily-like flowers for over twenty years without a break and is still as healthy as ever.

I think the first amaryllids which I saw in South Africa were *Cyrtanthus angustifolius*, with a small umbel of slim, long-tubed, drooping flowers of bright red on a rather long stalk and *Cyrtanthus Mackenii*, with pale cream-yellow flowers. They were growing near a tiny stream, among ferns and are dainty flowers, well worth planting. Further up the stream came later the taller *C. obliquus*, with pendulous flowers of bright scarlet, tipped with green. The long narrow tube of the *Cyrtanthus* flowers would help to identify them. Other good species are *C. collinus*, *C. O'Brieni*, *C. carneus*, *C. parviflorus* and *C. sanguineus*.

Though considered only a weed in its own country, the little bright yellow *Hypoxis stellata* var. *Gawleri* is pretty. It often avoids the lawn mower and stands up, gay and defiant, about 10 inches high, the starry flowers spread out flat. The white form, with the three outer segments green on the back, is also attractive and var. *elegans*, with a large or small blue-black or purplish spot at the base of the segments, is handsome.

Amaryllis belladonna is a South African native which is said to be hardy in the north if planted deeply. It is well worth cultivating, with its big rose-red flowers on stalks a foot or more high. The south and west know it quite well but it is not at all common in the north. Closely related is *Ammocharis* with its species *falcata* and *coccinea*. I have never seen one in America. They have a many-flowered umbel of open, trumpet-like flowers and *A. falcata* is very fragrant. They have a rather short stem and a crimson globe of flowers. They are odd and attractive. I saw them growing in Natal. They suggest a "gollywog" just a little bit. They would grow out of doors in the warmer regions and in pots in the north or possibly might be grown in the garden in summer, as they bloom rather late.

Another near relative of *Amaryllis belladonna* is the *Brunsvigia* or Candelabra Flower which has a giant cluster of crimson-scarlet blossoms at the end of a long stalk. The cluster is sometimes two feet across, suggesting a candelabra. It is very handsome. The strap-shaped leaves are produced after the flowers. *Brunsvigia Josephinae* and *B. gigantea* are especially fine.

Vallota purpurea, known in South Africa as the Berg or George Lily and in England as the Scarborough Lily, is a fine, lily-like flower, scarlet to dark red, with funnel-shaped flowers. I did not see it growing wild but I hung over a fence at Knysna, a little seacoast resort on the Indian Ocean and admired its beauty in a quaint little garden, it has been grown to some extent in America but might be much better known.

One day in the South African springtime, October, I was in a region which was like the abode of Oliver Herford's yak, "so far from anywhere". I was absolutely alone in a place filled with the ruins of a bygone civilization, a temple and fortifications of vast size and absolutely unknown origin. It is a strange country, almost uncanny. Tall tree Euphorbias grew among the ruins and queer low succulents. Suddenly there was a gleam of brilliant pink and I came on a gorgeous flower cluster. The stem was short, less than a foot long, the leaves had not developed but there were clustered at the end of the stalk in bud and flower, 20 to 30 huge, trumpet-shaped flowers, seven or eight inches long, pink with a crimson line down the outside of the segments and with long prominent stamens. It was a gorgeous sight. The plant was *Crinum forbesianum* and it would lend an exotic air to any flower-show, if it could be brought here. How I tried to bring home some of the enormous bulbs, as big as a person's head and did not succeed, is another story. I hope to get seeds some day. Crinums are lovely flowers and of the easiest cultivation; *C. Moorei* is mentioned above and *C. longifolium* is another good one, with a white, crimson-striped flower. There are many others.

Nerines are becoming more and more popular and never lose their charm. The lovely flowers, pale creamy pink, through coral shades to deep crimson are charming in themselves with their often flattened circle of lily-like flowers which have prominent, protruding stamens, growing at the end of a long stalk. An added attraction is the strange glitter of their surface as if it were set with thousands of tiny mirrors. At night, it looks as if strewn with gold-dust. I saw a delicate, dainty pink one, *Nerine appendiculata*, growing by a stream but in America, the *Sarniensis* hybrids are the best known. Any of the Nerines will repay cultivation and they are so easy to grow that they will bloom in a pot on a window-sill. I know they will because I have grown them there.

Two very curious amaryllids are *Haemanthus* and *Buphane*, the latter short-stemmed and interesting when it raises its thick stalk and crimson or purple globe of flowers among the grass of the Veld; the former, the Blood or Snake Lily, which shows a mass of bright stamens surrounded by bracts, often brilliant scarlet. It looks rather like a snake with uplifted head. The leaves are queer too. Sometimes there will be only two leaves and they may be nine inches broad and lie flat on the ground. I saw some of these odd flowers growing in a little glade in the Rain Forest at Victoria Falls in Southern Rhodesia. I saw them again in a "kloof" or valley among the mountains of the Cape Province and in other places. I have seen them grown under glass here in America and always there is the feeling that nature sometimes seems to enjoy a joke. The odd ways of these flowers are probably no joke, only a perfect adaptation of the plant to its surroundings but it was always an event to come on their broad, flat leaves or snake-like flowers. It was very delightful to be able to bring back some of the bulbs under a special permit from the U. S. Department of Agriculture.

I saw other amaryllids; *Hessea*, *Gethyllis*, *Cyanella* and others and gorgeous masses of the blue and the white, the tall and the dwarf *Agapanthus*, which Dr. J. Hutchinson of Kew now includes among the amaryllids but I must stop here with the reminder that the beautiful flowers of this South African group will well repay us for any care which we can bestow on them.



A. E. Challis

Canadian Government House White Hybrid Amaryllis

NOTES ON THE WHITE AMARYLLIS AT GOVERNMENT HOUSE, OTTAWA, CANADA

A. E. CHALLIS, *Government House,*
Ottawa, Canada

During recent years many white amaryllis have appeared on the market. Most of them were lacking in some of the essential qualities which constitute a good amaryllis. In the case of some, the face of the flower was white, but the back was stained with red or pink. Others required one to stretch the imagination to call them white. "Green with a small quantity of white," would more accurately describe many so-called whites. Lack of size in the bloom was the weak point of another class. As lately as 1934 I had three bulbs of white amaryllis sent me from Holland, but so far I have not succeeded in getting a bloom from them that reaches six inches in diameter.

My own experiments have been confined entirely to the whites. This is due to the fact that I have only a very limited amount of space. My aim has been to produce a white with the three essential qualities,—purity, form and size.

The group photograph shows a number of seedlings including two pure whites. In my opinion the one in the lower right hand corner is the best shaped bloom, but it does not possess the vigor of some of the seedlings. Later in the season, two more whites came into flower.

The variety shown in the upper center of the plate has been named *Stansted*. Before this could be recorded, it was inspected by a committee appointed by the Canadian Horticultural Council, and it was on their recommendation that the variety was named and recorded by the Council. The flower shown measured thirteen inches and any person fond of mathematics can easily calculate the size of the flower by measuring the diameter of the stem.

It will be seen that we have secured purity and size, but the third essential quality—form—is still missing. Next spring we hope to flower the first of the progeny of these four white plants. It may be that among these seedlings there will appear one or more which will reach our standard of purity, form and size.

Through the kindness of one of your members, I have had the pleasure of reading the 1935 Year Book of the American Amaryllis Society. May I congratulate all those concerned upon the results of their efforts. Interesting, authoritative and up-to-date, it should prove satisfying to all who are growing amaryllids.

NEWS-NOTES FROM GERMANY

The copy of the very interesting 1934 Year Book has been received, and I shall write a review on it for *Gartenschönheit* and also for *Gartenflora*.

I shall also do my best to secure information concerning the best strains of amaryllis in Central Europe for some notes in a future issue of the Year Book.

Mr. Bornemann, in whom you are interested, died long ago and most of his hybrids have been lost. We do not have at present such good strains in Germany as they have in England and Holland.

Berlin-Charbg, 9,
11. April 35.

CAMILLO SCHNEIDER.

* * * * *

At Sans Souci near Potsdam there is quite a good collection of amaryllis. I know Director P. Kache well who has brought it together. I spoke with him about the stock he has. He told me that it does not contain anything new. We have at present no one in Germany who tries to raise new varieties by scientific breeding methods. About 30 years ago or even longer there were two persons in this country who took great interest in amaryllis.

There are no pure white amaryllis at Potsdam. I know them only from England where Mr. Lionel de Rothschild has the best collection I ever have seen. The Holland growers most likely have them also. I have seen the Potsdam-Sans Souci collection almost every year but have not as yet found a really pure white one comparable with what Mr. Rothschild has.

Berlin-Charbg. 9.
17. June 35.

CAMILLO SCHNEIDER.

* * * * *

You will be interested to note that Director Lobner at Friesdorf near Bonn a Rh. has made some new amaryllis crossings but the work has not progressed far enough at present for a report. In another season I hope to have more news for the members.

Berlin-Charbg.9.
14. June 36.

CAMILLO SCHNEIDER.

NEWS-NOTE FROM BRASIL

Hippeastrum rutilum crocatum has reddish-orange colored flowers with yellow tones and should prove valuable in your breeding work. I secured several bulbs of this species and will make some crosses during the next blooming period which will probably be in November-December. As soon as possible I will send seeds for the American Amaryllis Society Trial Collection. On my next trip to Rio de Janiero, I will make further enquiries about other yellow-toned amaryllis.

9. January, 1936
Sao Paulo, Brasil.

JOAO DIERBERGER, JR.

NEWS-NOTE FROM AUSTRALIA

I have made extensive enquiries about the late John Bidwell, the originator of the Belladonna-Brunsvigia hybrids. He was the Director of the Sydney Botanical Gardens from the early '30's to about 1855, but these dates have not been definitely fixed. I can find no papers by him at the Gardens but am making further enquiries.

"Telopea", Military Road,
Mosman, N. S. W. 17-3-36.

G. K. COWLISHAW.

AMARYLLIDS AT THE 23RD ANNUAL INTERNATIONAL FLOWER SHOW, NEW YORK, MARCH 16-21, 1936

FREDERICK KIRKHAM, *New York*

Amaryllis were strongly featured at the twenty-third annual International Flower Show in New York, March 16-21 of this year, and one of the outstanding classes of the exhibition was the new class for *display of hybrid Amaryllis, 50 sq. feet*, which was added by the schedule committee in recognition of the increasing popularity of this beautiful flower.

The awards in this special class were as follows:

- First: Mrs. John M. Schiff, Oyster Bay, L. I., N. Y.
- Second: Mr. Rosewell Eldridge, Great Neck, L. I., N. Y.
- Third: Mr. Marshall Field, Huntington, L. I., N. Y.

(continued on page 113)

1936

*American Amaryllis Society**Richard Diener, Oxnard, Calif., Exhibit, awarded first prize for best display at the Third National Amaryllis Show, Orlando, Fla., April 7-8, 1936*



American Amaryllis Society

Heaton Exhibit, Third National Amaryllis Show, Orlando, Fla., April 7-8, 1936

THIRD ANNUAL NATIONAL AMARYLLIS SHOW,
ORLANDO, FLORIDA, APRIL 7 AND 8, 1936²

H. HAROLD HUME, *Gainesville, Florida*

The third National Amaryllis Show of the American Amaryllis Society was staged in the Chamber of Commerce Building, Orlando, Florida, April 7 and 8, 1936. Thousands of hybrid amaryllis and representatives of many other Amaryllids were displayed. The holding of the exposition was well timed for the most part, and the exhibits were noteworthy both for quantity and quality. Upwards of ten thousand people saw the blooms.

At the first show held in Orlando in 1934, the feasibility of shipping Amaryllis flowers in bud long distances was demonstrated. This was repeated for the 1935 show. Richard Diener's colorful display merited the first place award for a striking showing, the more meritorious because the flowers in bud had come all the way from Oxnard, California.

Noteworthy among the flowers displayed were the varieties of Dutch origin shown by I. W. Heaton. These illustrated the perfection of form and color to which the Holland amaryllis breeders have been able to bring their varieties. Also they emphasized the difference in the ideals held by breeders in Europe and in America.

The awards made in the several classes were as follows:

SECTION A, AMARYLLIS (GENUS HIPPEASTRUM)

CLASS 1, Single entries of *Hippeastrum* species; *Hippeastrum Johnsoni*, first, Frank Vasku; second, W. Hayward. *Hippeastrum rutilum crocatum*, first, Frank Vasku. *Hippeastrum rutilum fulgidum*, first, Frank Vasku. *Hippeastrum equestre major*, first, Frank Vasku, second, W. Hayward. CLASS 2, Best collection of botanical species and varieties, first, W. Hayward; second, Frank Vasku.

CLASS 3, best collection of 10 or more Grandiflora varieties (Exhibition types), first, I. W. Heaton, Orlando, Florida; second, Richard Diener, Oxnard, Calif. CLASS 6, best display, first, Richard Diener, Oxnard, Calif.; second, I. W. Heaton, Orlando, Fla.

CLASS 10, best bloom in show, I. W. Heaton with Scheepers-Warmenhoven entry, a handsome Leopoldi type A, compact petal salmon shade.

Grandiflora Varieties

Reginae type A (rounded petals), CLASS 201, white without markings, first, Wyndham Hayward. CLASS 202, white with slight pale red markings, first, I. W. Heaton. CLASS 203, white with lighter red markings, first, Wyndham Hayward; second, Mrs. W. K. Miller, Orlando, Fla.; third, Mrs. R. E. Kline, fourth, I. W. Heaton. CLASS 211, orange without markings, first, I. W. Heaton. CLASS 212, orange with slight markings, first, I. W. Heaton. CLASS 221, red with slight markings, first, Mrs. R. E. Kline, second, I. W. Heaton. CLASS 223, dark red, first, Frank Vasku; second, Peterson & Riedel. CLASS 226, rainbow and tricolor types, first, I. W. Heaton.

Reginae type B (pointed petals), CLASS 251, white without markings, first, Frank Vasku; second, Wyndham Hayward. CLASS 252, white with slight pale red markings, first, I. W. Heaton; second, Frank Vasku; third, D. A. Anderson, Orlando, Fla. CLASS 253, white with lighter red markings, first, John Springer, Orlando, Florida; second, I. W. Heaton; third, Albert Stuckie, Orlando, Fla.; fourth, D. A. Anderson. CLASS 254, white with lighter red stripes, etc., first, Mrs. A. Morton, Orlando, Fla.; second, John Springer; third, D. A. Anderson. CLASS 255, white with red stripes, etc., first, Wyndham Hayward; second, John Springer; third, Mrs. R. E. Kline, Win-

²EDITORIAL NOTE—The committee of judges was constituted as follows,—Mr. H. H. Hume, Chairman, Gainesville, Fla., Mr. A. T. Coith, and Mrs. Geo. M. Bahrt, both of Orlando, Fla.

dermere, Florida; *fourth*, Mrs. A. Morton. CLASS 262, orange with slight markings: *first*, I. W. Heaton. CLASS 263, orange with distinct markings, *first*, I. W. Heaton.

CLASS 266, pale red with distinct markings, *first*, John Springer; *second*, I. W. Heaton; *third*, D. A. Anderson. CLASS 267, lighter to light red without markings, *first*, Mrs. A. Morton; *second*, Harry E. Searles, Orlando, Florida; *third*, I. W. Heaton; *fourth*, Albert Stuckie. CLASS 268, lighter to light red with slight markings, *first*, Mrs. R. E. Kline; *second*, Wyndham Hayward; *third*, Albert Stuckie. CLASS 269, lighter to light red with distinct markings, *first*, John Springer; *second*, Peterson & Riedel; *third*, Harry Searles. CLASS 271, red with slight markings, *first*, I. W. Heaton; *second*, D. A. Anderson; *third*, Mrs. A. Morton. CLASS 272, red with distinct markings, *first*, Wyndham Hayward; *second*, Mrs. A. Morton. CLASS 273, dark red, *first*, John Springer; *second*, Frank Vasku; *third*, Mrs. B. A. Dominick, Orlando, Florida; *fourth*, Harry Searles. CLASS 277, any other color (strawberry red), *first*, Wyndham Hayward.

Leopoldi Type A, (compact petals); CLASS 302, white, with slight pale red markings, *first*, I. W. Heaton. CLASS 318, lighter to light red with slight markings, *first*, I. W. Heaton. CLASS 319, lighter red to light red with distinct markings, *first*, Wyndham Hayward. CLASS 321, red with slight markings, *first*, Wyndham Hayward. CLASS 326, rainbow and tri-color types, *first*, Mrs. A. Morton.

Leopoldi Type B, (pointed petals); CLASS 353, white with lighter red markings, *first*, I. W. Heaton. CLASS 363, orange with distinct markings, *first*, Mrs. R. E. Kline. CLASS 368, lighter red to light red with slight markings, *first*, I. W. Heaton. CLASS 369, lighter red to light red with distinct markings, *first*, I. W. Heaton. CLASS 371, red with slight markings, *first*, Frank Vasku.

Decorative Types (new class, size no object); CLASS 51, white without markings, *first*, W. Hayward. CLASS 52, white with slight pale red markings, *first*, I. W. Heaton; *second*, Frank Vasku; *third*, W. Hayward. CLASS 53, white with lighter red markings, *first*, I. W. Heaton; *second*, Peterson & Riedel. CLASS 63, orange with distinct markings, *first*, W. Hayward; *second*, John Springer; *third*, Peterson & Riedel. CLASS 68, lighter red to light red with slight markings, *first*, John Springer, *second*, W. Hayward; *third*, D. A. Anderson; *fourth*, Mrs. R. E. Kline. CLASS 72, red with distinct markings, *first*, Wyndham Hayward; *second*, Harry Searles; *third*, D. A. Anderson, *fourth*, Mrs. B. A. Dominick. CLASS 76, rainbow and tricolor types, *first*, Wyndham Hayward, *second*, Albert Stuckie. CLASS 77, any other color, *first*, Mrs. R. E. Kline, *second*, W. Hayward.

Grand Prize, First Class Certificates, etc.

Grand prize (hybrid Amaryllis), *for most points*, I. W. Heaton.

First Class Certificates, (awarded for meritorious new varieties as worthy of naming and propagation for introduction) I. W. Heaton, 8 certificates; Richard Diener, 4 certificates; Wyndham Hayward, 4 certificates; John Springer, 3 certificates; Frank Vasku, 3 certificates; Mrs. R. E. Kline, 2 certificates, for floral arrangement and for culture (bulb exhibited with four bloom scapes); Mrs. A. Morton, 1 certificate.

Awards of Merit, to Richard Diener, for display of California grown hybrid Amaryllis shipped by air express; to I. W. Heaton and Heaton Bulb and Palm Co., for decorative display of Florida-grown hybrid Amaryllis.

Best Bloom awards, in various types: *Reginae Type A*, I. W. Heaton; *Reginae Type B*, Frank Vasku; *Leopoldi Type A*, Frank Vasku; *Leopoldi Type B*, I. W. Heaton; *Decorative Type*, Wyndham Hayward.

SECTIONS B, C, AND D

CLASS 501, Hemerocallis, (Day Lily) hybrids, *first*, Wyndham Hayward, with "Midas" (Stout) and "Chrome Orange" (Mead), *Honorable mention*, E. L. Lord, Orlando, Fla., for display of hybrids including "Sovereign", "Estmere," etc., on second day of Show. CLASS 801, Crinums, (a) hybrids, *first*, Wyndham Hayward, with "Cecil Houdyshel" (Houdyshel) and "Peachblow" (Mead). (b) Species, *first*, Wyndham Hayward, for *Crinum Kunthianum*; *second*, Dr. H. P. Traub, for *Crinum*

Asiaticum. CLASS 851, *Zephyranthes*; first, W. Hayward, for *Z. treatiae*. CLASS 901, *Clivia miniata* hybrids, first, Wyndham Hayward. CLASS 1001, *Hymenocallis occidentalis*, Honorable mention, W. Hayward. *Eucharis grandiflora*, first, Frank Vasku; second, W. Hayward.

* * * * *

A few comments from the judges, A. T. Coith, Orlando; Mrs. George M. Bahrt, Orlando; and H. Harold Hume, Gainesville, Florida, may not be out of place,—

More space to afford open arrangement of the specimens would be highly desirable. Each class should, if possible, be shown distinct and apart from others. This would result in a more beautiful display from the standpoint of the exhibition as a whole.

Would it be well to give greater regard to the number of flowers borne on the scape with emphasis upon those bearing four blooms or more? It would appear advisable for breeders to establish this number as their minimum.

Is there such a thing as having blooms too large? We incline to the belief that the future of the amaryllis hybrid group will be best served by stressing form, color and artistry rather than size. Flowers of too large size may even affect injuriously the popularity of these plants. It is possible that size may accentuate defects without increasing the value of good points in blooms.

It is our belief that the decorative value of flower form should be emphasized more strongly. As an instance of this, there appears to be an appeal in the flowers of *Hippeastrum rutilum* varieties in separated petals and upturned blooms that may have distinct value. Too great formality in the flowers may result in lack of interest, such as happened with Camellias a number of years back.

For the Show as a whole and in the interest of the entire undertaking, flowers of many lovely amaryllids and related plants, absent from the 1936 exhibition, can well receive attention to the end result of a larger and more varied display. We refer to *Hymenocallis*, *Crinum*, *Zephyranthes*, *Sprekelia*, *Alstromeria*, *Clivia* and *Hemerocallis*, to mention only a few. It might even be worth while to consider holding a secondary show for those that cannot be brought into flower for March or April staging.

Those who undertook the planning and holding of the 1936 Show are entitled to great credit for the excellence and variety of the exhibits and for the work they did in the interest of fine plants and good gardens.

AMARYLLIS FLOWERS SHIPPED FROM COAST TO COAST

I. W. HEATON, *Florida*

In connection with my duties as manager of the Third National Amaryllis Show, I had the pleasure of receiving and handling Mr. Richard Diener's exhibit of hybrid amaryllis. These flowers were cut, packed and shipped from Oxnard, California on Thursday, April 2nd. Traveling by air express, the shipment was delivered to me by the local express agent at 1.30 P. M., April 4th. The blooms were taken to our packing shed, stems were cut, and scapes placed in cool water, each stem standing upright, where they remained in the open air. On Monday they were removed to the exhibition hall to be staged. These flowers had been shipped dry, three scapes tied in a bunch. They arrived in good condition with one exception. In every case the first two buds had tried to open in transit and for this reason the flowers were twisted, facing upright. When staged the stem was inclined to correct somewhat the upright position of the flowers. Only one suggestion for improvement could be offered. If the blooms had been cut one day earlier in development, they would not have opened in the packing case. The size of the flowers might be slightly smaller if cut earlier but would be in better condition for exhibition with the flowers in normal position on the scape.

THREE AMARYLLIS SHOWS

MRS. GEORGE M. BAHRT, *Florida*

Exhibited at each of the amaryllis shows held at Orlando, were quantities of clear bright blossoms banked in *Asparagus plumosus* and set off by graceful palms. At each show the arrangement of these blooms was similar and the general effect was essentially the same. Each year however, as a result of the strides made in amaryllis culture—production of new varieties of unusual coloring and more perfect specimens—a keener delight and enthusiasm was experienced.

At the 1934 First National Show most of the blooms were white with red markings, or in various shades of red, and the flowers were arranged with such care that the shades graded into each other very harmoniously. The reds so dominated the show, however, that the pure white and the copper gold entries stood out as conspicuously as if they had been framed.

In 1935, at the Southeast Regional Show, there were fewer flowers exhibited, but a number of very fine specimens, especially of the Leopoldi type were shown. On the whole there were more entries other than red than were displayed the previous year. The Aztec Lily (*Sprekelia formosissima*) was exhibited for the first time at these shows and it attracted a great deal of attention because of its peculiar orchid-like shape.

The Third National Show held this year was even better than the two previous shows. There was a tendency to replace the more common reds so dominant the first year with the more pleasing and striking shades of red. Pure white, white with distinctive markings, bronze and orange colors were more in evidence than before. Although outnumbered by the Reginae type, the Leopoldi type as a whole outclassed them in real beauty. Some of the perianths were so rounded that they gave the appearance of orbicular instead of star-shaped flowers. The exhibit of the Reginae type from Mr. Diener in California deserves special mention. Because of the mammoth well formed and beautifully marked flowers of fine texture, they typify varieties other than the Leopoldi type which may have considerable artistic and ornamental value.

A third type known as the "Decorative" was introduced for the first time this year. It differs from the other types in that the size of the bloom is not considered of primary importance. The recognition of this type added greatly to the show since it brought in flowers of unusual texture and color which otherwise might not have been entered because of size limitation.

To-date flower arrangement has not been a feature of the show but the Decorative type would furnish excellent material for it. Flower lovers everywhere are becoming interested in artistic floral arrangement to show off the beauty of the flower to the best advantage, and as the amaryllids are becoming more and more popular each year it seems appropriate that some space be set aside at future shows for artistic arrangements of amaryllids in bouquets for both homes and public places.

THE 1936 AMARYLLIS SHOW OF THE BUREAU OF PLANT
INDUSTRY, U. S. DEPARTMENT OF AGRICULTURE

The twenty-third annual Amaryllis Show of the U. S. Department of Agriculture was held at the Department Greenhouses, Fourteenth Street and Constitution Avenue, N. W., Washington, D. C., from March 19 to March 26, 1936, inclusive, being open each day from 9:00 a. m. to 9:00 p. m. The display was viewed by 28,387 people, including classes from public and private schools, members of garden clubs, and out-of-town as well as local florists and commercial growers.

The exhibition comprised 1,260 amaryllis bulbs, each of which bore two or three flower stems, some more than two feet long, with from two to seven flowers on each stem, making a display of several thousand flowers ranging in color from dark velvety red through various shades of red, pink, orange, yellow-orange and striped



U. S. Department of Agriculture

White Amaryllis at the 1936 U. S. Department of Agriculture Amaryllis Show



U. S. Department of Agriculture

Amaryllis Show, U. S. Department of Agriculture, March 19-26, 1936, Washington, D. C

types to pure white. A number of the blooms measured eleven inches from tip to tip.

The plants were arranged in the exhibition house on two side benches and on a center elongated pyramidal staging. Small pots of *Vinca major* with rounded grey-green leaves edged with white were placed between the pots of amaryllis to form a pleasing combination with the pointed dark green leaves, thick silvery green flower stems and clear bright blossoms of the amaryllis. Several large pots, each containing a group of bulbs in flower, were placed along the ridge of the center staging to provide accent notes.

The bulbs in the Department's collection of amaryllis are hybrids resulting from many years of breeding conducted by Department of Agriculture experimenters since 1909 when twelve varieties were imported from England. The Amaryllis Shows are exhibitions of the results achieved by the Department in one of the many phases of its work to produce improved forms. Department workers with amaryllis have successfully endeavored to obtain longer stems, new shades and larger flowers. The white amaryllis was produced through successive selection and cross-pollination of striped flowers showing the most white. A group of seedlings, flowering for the first time this spring, revealed new subtleties of color, particularly in the pink and red shades.

The Department has held an Amaryllis Show each year since 1912 with the exception of the years 1914 and 1915.

DAFFODIL NOTES

MISS MARY McD. BEIRNE, *Virginia*

The Editor has reminded me of a promise to continue some Daffodil notes, begun in the Amaryllis Year Book for 1935.

He writes that his copy has already gone to press. So the best apology to be made at the moment, is a hurried dispatch, listing popular entries, observed at our Spring Narcissus shows.

The author visited or judged exhibitions of narcissi during the past season, in several sections of Virginia, as well as in the states of Maryland, Pennsylvania and New York. Popular opinion therefore, may thus be interpreted, through expressions from this particular section of the country.

Among Yellow Trumpets, *Aerolite* is still a favorite and will continue, in all probability, to replace many older varieties, as it becomes available. The two *King Alfred* seedlings *Warwick* and *Matamax* appear close competitors; while *Lord Antrim* is invariably shown in fine form. Its great height and good even color never fail to excite interested comment from visitors.

In the classes for White Trumpets, it is significant that the far-famed *Beersheba* is gradually giving place to more vigorous types of plants, such as *Everest*, *La Vestale* and the semi-dwarf *Mrs. John Bodger*. *Kantara* does not seem to develop, in this country, the high quality necessary for show, which it exhibits abroad.

Askelon is another White, which has not become sufficiently acclimated, to achieve the distinction promised for it. But there are many more better varieties on their way.

Penquite, with neat yellow perianth and richly colored golden orange cup, deeply frilled at the margin; *Diolite*, a very large show flower with crown of light yellow, slightly reflexed perianth and deep orange rim to the cup, were two grand Incomparabilis noted.

Porthilly is a bit disappointing to those who anticipated a more sensational flower. But very possibly, this may be due to the vagaries of the past season.

Killigrew showed itself, as always, of the same high quality both in color and form.

Of the Bicolor Incomparabilis, *Adler* continues a favorite. The flower is purest white with beautifully proportioned cup of chrome yellow, deeply frilled tomato color at the edge.

L'aiglon, a star-shaped beauty of soft creamy white is adorned with a scarlet-orange rim; while *Clava* remains distinct and outstanding because of clean cut colors, petals purest white and a bowl shaped shallow crown of clear bright yellow.

In the Barrii section *Alcida* appears ubiquitous and unfailing in popularity; a giant of creamy color with a telling blood-orange frill.

Seraglio, an exceptional beauty in this same class, is almost as important as the incomparably lovely *St. Egwin*, a tall, large clear self-yellow show flower of the highest quality.

Among Bicolor Barrii, there seems little to approach *Hades*, in the depth of the warmth of its fiery colored crown. Also one is startled by the beauty of the Brodie's *Forfar*, with purest white perianth and an all red cup.

Ely Ney has the whiteness of a poeticus with crown of lemon yellow, edged deep blood red.

In the Leedsii section, there are few flowers finer than the great *Giant Tenedos*, now moderately priced. *Gracious*, Van Leeuwen's creation is another remarkable and distinguished variety of its class. *Daisy Schaffer*, *Marmora* and *Grayling* are all blue ribbon candidates, possessing alike the finer qualities of distinction and form.

Nelly, *Distingue* and *Pucelle* are beautiful varieties among short-cupped Leedsii. *Pucelle* is possibly the most rarely seen of the group. It was this flower which we said last year, is always spoken of abroad, as the White *St. Egwin* and not *Nelly*, as quoted through typographical error.

NATIONAL AMARYLLIS SHOWS FOR 1937 AND 1938

The Board of Directors at its Spring meeting awarded the fourth or 1937 National Amaryllis Show to Southern California, and the fifth or 1938 Show to New York City.

The arrangements for the 1937 Show will be made by Mr. Fred H. Howard, Vice-President of the Society. This will be the year of the centennial of Herbert's Amaryllidaceae, published in 1837, and in honor of the author, the William Herbert Medal, the highest award of the Society, will be awarded for the first time. For details about the Show write to Mr. Fred H. Howard, Montebello, Calif.

Mr. John Scheepers, Chairman of the Exhibitions and Awards Committee, will be in charge of the fifth or 1938 National Amaryllis Show to be held in New York City. Mr. Scheepers will make detailed announcements later through the 1937 Year Book and the horticultural and local press.

SOUTHEASTERN REGIONAL AMARYLLIS SHOW IN 1937

The 4th. Southeastern Regional Amaryllis Show will be held in early April of 1937 in Florida. The Show will be managed by Mr. I. W. Heaton, member of the Exhibitions and Awards Committee for the Southeast. Announcements will be made through the local and horticultural press.

2. COLOR DESCRIPTION

PHOTOGRAPHING FLOWERS IN NATURAL COLORS

AUGUSTUS WOLFMAN,

E. Leitz, Inc., New York, N. Y.

It is indeed very desirable to the individual engaged in the study of plant life and flowers to obtain photographs of the various specimens he studies, and it would be of much greater value if the latter could be reproduced in their natural colors. Systems which make color photographs possible have been available for some time, but these systems have been cumbersome to handle, requiring a relatively long exposure, and the use of a large number of filters to correct the unbalanced color sensitivity of the emulsion on the film or plate, various conditions of light requiring the use of the different filters.

Now there is available the Dufaycolor process which employed in conjunction with the Leica camera makes the taking of natural color pictures of plant specimens a simple matter. The relative speed of this film is about the same as that of ordinary roll-film such as the Eastman N. C. Roll-film, opening up many possibilities in the taking of color pictures.

Before going into further detail about this process it would be well to review some facts upon which a color process is dependent. White light (daylight) consists of all the visible colors of the spectrum, and for practical purposes is divided into three primary colors, red, green, and blue. White light is obtained by a mixture of these three colors, whereas other colors are obtained by various mixtures of them, as, yellow light is produced by a mixture of red and green light, magenta by mixing red, and blue, etc.

The essential feature of Dufaycolor film, upon which the process is dependent, is a screen or pattern on the base of the film consisting of microscopic lines and squares composed of the three primary colors. In use the film is loaded into the Leica camera with its base side, rather than the emulsion side towards the lens. This is contrary to the usual practice wherein the emulsion faces the lens.

The light coming from the lens first passes through the color screen then reaching the emulsion, affecting the latter. Each line and square of color acts as a filter producing on the emulsion directly behind it a record of its color. The strength of the individual record behind each line or square is dependent upon the amount of the color of the square or line in the subject.

The film is first developed as a negative; the negative is then bleached out leaving the emulsion which has not yet been affected by light. It is treated with a clearing bath after having been bleached, and then exposed to light and again developed, the result being a positive. The film is now fixed and hardened in the usual manner. After washing, the film is dried, presenting a transparency exhibiting the subject in its natural colors.

The formulas for processing Dufaycolor film are as follows:

Formulas can be mixed in smaller quantities as required.

1. First Development

Metol	16 1/4 grams
Hydroquinone	5 grams
Sodium Sulphite (dry)	125 grams
Potassium Bromide	7 grams
Sodium Carbonate (dry)	87 grams
Potassium Thiocyanate	22 1/2 grams
Water up to	2,500 cc

Dissolve all chemicals in the order given, cool to 65° F. Development time in the above bath with correctly exposed subjects: 3 1/2 minutes at 65° F. (This developer will keep in a tightly stoppered bottle or in case a tank is used, use a tight fitting cover.)

2. Wash 2 minutes.

3. Bleaching Bath (Reversing)

Potassium Permanganate	3 grams
Sulphuric Acid	10 cc
Water	1000 cc

Bleach until image is clearly visible, time about 4 minutes. Bleaching is completed when the image is clear and there is no veiling. A weak light can be turned on after 2 minutes for inspecting the film.

4. Wash for about 2 to 3 minutes in running water.

5. Rinse for 2 minutes in following clearing bath.

Clearing Bath: 2½ % of Sodium Bisulphite

Sodium Bisulphite	25 grams
Water	1000 cc

6. Wash 3 minutes after clearing.

7. Expose film to strong artificial light (100-watt bulb) for about 3 to 4 minutes. Then the film is redeveloped in any good metol-hydroquinone bath. The following may be used: (Film can be underexposed but not over)

Metol	4 grams
Hydroquinone	18 grams
Sodium Sulphite (dry)	200 grams
Potassium Bromide	4 grams
Sodium Carbonate (dry)	75 grams
Water up to (at 125° F.)	4000 cc

Time of final development: 3 to 4 minutes at 65° F., or even 6 minutes if required. When image is thoroughly darkened, development is complete.

8. Rinse thoroughly (2 to 3 minutes)

The film is now fixed and hardened and given a final washing. Use weak acid fixing bath—wash in running water 20 minutes—wipe dry with cotton or a viscose sponge in order to avoid water marks.

Dufaycolor Film is provided for the Leica camera in daylight loading and unloading spools containing enough film for 30 exposures. As has been mentioned the emulsion is so well balanced in color sensitivity that no filter is required in ordinary daylight photographing. However when photographing distant views in which case there usually exists an abundance of ultra-violet light, to which the film is very sensitive, a U. V. (ultra-violet) is employed. With Photoflood or Photoflash illumination it is necessary to employ the Dufaycolor No. 1-A filter to eliminate some red light, for this illumination contains a larger proportion of red light than daylight. The Dufaycolor No. 1-B filter is used for ordinary mazda light. This filter has the ability of holding back a greater amount of red light than the 1-A filter and is employed in this case because ordinary mazda light contains a greater proportion of red than Photoflood or Photoflash illumination. When employing an exposure meter the film speed at which the latter is set for Dufaycolor film is 16-degrees Scheiner.

With the use of the Sliding Focusing Copy Attachment which the Leica camera accommodates greatly enlarged color photographs (macrophotographs) of a specific part of a flower, etc. can be taken. This will reveal minute detail not visible on normal inspection, and will also exhibit the color of the enlarged section. Stereoscopic color photographs can also be taken with the Leica camera in conjunction with the Stereoly Attachment, so that the subjects will be seen in their full depth as they exist in nature, and in addition with the color imparted to them through the use of Dufaycolor film. The subjects will appear in the stereoscopic pictures practically in the same way as they are normally seen.

It is quite evident from the brief description of Dufaycolor film that when employed with the Leica camera and its various accessories, it affords the individual interested in plant life an invaluable tool for obtaining records of various specimens.

In addition it must be borne in mind that the Dufaycolor film preserves the natural color of the specimen. At present it is only possible to produce color transparencies with this process, which may be viewed by transmitted light, or can be projected on a screen with the aid of one of the special Leica projectors. However many experimenters are working on the production of actual color prints through the use of Dufaycolor Film and one may expect that in the future color prints will be available.

THREE-COLOR, ONE-EXPOSURE CAMERA ¹

The customary method of making a set of colour-separation negatives for colour photography is by successive exposures on separate plates through the appropriate colour filters. Usually three negatives are required. This method fails for snapshot exposures of moving objects. For many years inventors have attempted to devise three-color cameras operating with a single exposure during which all three images are simultaneously recorded. Several of the optical devices which have been used to achieve this end were briefly described by Dr. D. A. Spencer in 1933 (*Photog. J.* 74:103.1934) and a further method was described in 1934 (*Ibid.* 74:244.1934) by the late W. T. P. Cunningham.

One of the less difficult methods depends on the use of two inclined, semi-reflecting, plane mirrors. Light from the camera lens strikes the first mirror and a portion of it is deflected to form an image on one of the photographic plates placed behind its suitable colour filter; the remainder of the light goes on and meets the second mirror, which deflects a portion on to the other plate, and the remainder goes on to the back of the camera where the third filter and plate are situated. One objection to this method is that reflection takes place at both surfaces of each mirror and if the mirrors are thick, double images may be formed. This has led to the use of thin pellicle mirrors which are said to have been suggested by Geisler so long ago as 1910 (*see Spencer, loc. cit.*) and have recently been made as commercial articles by Mr. H. O. Klein. It is said that other ways of avoiding double images with this general arrangement of semi-reflecting mirrors are also available.

The method has therefore led to considerable practical success and at present there are available two cameras which make use of it. These were both shown at the recent British Industries Fair. One is the Taylor-Hobson three-colour camera (Vivex system) and the other is the Klein tri-colour camera invented by Adrian B. Klein and manufactured by Messrs. Bellingham and Stanley, Ltd. These cameras are said to work successfully to give exposures ranging from 1/25 sec. to 1/10 sec. in winter sunshine. Inquiries about these cameras should be addressed, in relation to the first to Colour Photographs, Ltd., Victoria Road, Willesden, N. W. 10; and in relation to the second to Messrs. Farquhar and Maloney, 15-16 Newman Street, London, W. 1., or to Messrs. Bellingham and Stanley, Ltd., 71 Hornsey Rise, London N. 19.

COLOR PRINTS BY THE EASTMAN WASH-OFF RELIEF PROCESS

Under date of June 2, Mr. R. P. Meinhard of the Eastman Kodak Company, Rochester, N. Y., writes with reference to color prints by the Eastman Wash-Off Relief Process,—

"The process yields prints of great beauty and accuracy, and has created unusual interest throughout the country. It requires considerable technique, but we judge your group would be equal to it, and the results are very much worth while. I expect shortly to have a print of a picture made at a recent flower show. I believe that the subject will be of particular interest to the Amaryllis Society, and, if possible, I shall send it to you for your inspection."

The process is described in detail in *Studio Light*, 27: 4-8. 1936, published by the Eastman Kodak Company, from which the following brief statement is quoted,—

"A prolonged study of existing processes of making three-color prints on paper

¹Nature, 135: 479. 1935.

has been made . . . with the result that satisfactory materials and working instructions for a thoroughly practical process have been available to color photographers for about two years.

"The process selected for its distinct advantages over other processes previously employed was that in which relief images are formed on transparent supports, dyed with water-soluble dyes, and the dye images transferred to paper.

"The advantages are the ease with which the print quality is controlled, the opportunity of making duplicate prints at low cost by redyeing the same relief images, and the possibility of printing on a variety of available paper surfaces. Transparencies can also be made by superimposing the dyed relief images instead of transferring the dyes to paper."²

THE FISCHER COLOR CHART

The Fischer Color Chart, published by the New England Gladiolus Society, was adopted as the official standard by the American Amaryllis Society in 1933, and since that date the Publishers have kindly agreed to offer this very valuable Chart mounted on heavy cardboard to members of the American Amaryllis Society at \$2.00. Send orders to your Secretary, Mr. Wyndham Hayward, Winter Park, Florida.

R. H. S. HORTICULTURAL COLOUR CHART³

The Royal Horticultural Society, Vincent Square, London, S. W. I., has decided to publish a Colour Chart for Horticultural purposes. With this in view a Committee has been appointed to collaborate with Mr. Robert F. Wilson, Art Director of the British Colour Council.

It is pointed out that the utility of this Chart need not necessarily be restricted to horticultural purposes, but it will be useful for all purposes where colour is employed, either by the amateur, professional or trade: be it for paints, textiles, printing, etc., etc.

The successful production of such a Colour Chart is governed by the following factors:

- (a) That it must be in a handy form:
- (b) That the range of colours must be sufficient:
- (c) That the book must be cheap.

After examination of the *Repertoire de Couleurs* (Oberthur et Dauthenay) and *Ridgway's Colour Standards* (both books out of print), it is thought possible to produce a book containing a hundred colours, each with four tones, making a total of 400 tones, which would serve a very useful purpose to all gardeners and lovers of flowers. In proportion to the popularity and success of this proposed Chart, it is the intention to produce a supplementary section of a further hundred colours, giving a further 400 tones, which would be so prepared as to be easily interpolated in the first section, making two volumes with a total of 200 colours and 800 tones. The volumes will be Royal Octavo and the plates either loose in the cover or held on a loose-leaf binding system. The descriptive matter on each plate would consist of the name of the colour, that is, the standard name given by the British Colour Council, being the name applied to the colour for whatever purposes the colour may be used in any and every business. These names will also be rendered in French, German, Italian and Spanish: a reference to such of the tones as correspond with those of the

²EDITORIAL NOTE—The color print referred to above was received by the editor, and it proved to be a most wonderful art object. The subject is a display of red roses in a tall wicker basket set against a colorful stone garden or patio wall. The tile floor in the fore-ground has rich tones, and brilliant tulips in flower are on either side at the base of the flower container which in itself is an object of great beauty. This gives only a very inadequate word description of a very colorful subject.

³This announcement was received from the Secretary of the Royal Horticultural Society and is given in full for the benefit of the members.

Repertoire de Couleurs, Ridgway's and Ostwald's Colour Standards: and the colours and tones described by flowers and plants well known throughout the horticultural world.

The first volume of 100 colours, in four tones, has been estimated at 10/- per copy, a price which it is thought should be popular. It may be presumed that the second volume can be produced at the same price.

It is, however, essential that some idea of the edition should be ascertained. Those interested in the publication of the chart may notify the Society of their willingness to support the proposal. It must be borne in mind that, should the anticipated demand be exceeded, it might be possible to reduce the price and thus make the Chart of more universal and of greater value.

Every endeavour will be made to produce the first section during 1936 or early in 1937, and active preparations will be carried on for the issue of the second volume, should the demand justify it.

USE OF THE FISCHER COLOR CHART IN DESCRIBING HYBRID AMARYLLIS

I. W. HEATON, *Florida*

A complete description of amaryllis flowers must contain not only the classification of form and type but also an accurate description of color, based upon a standard chart and thus eliminating the common indefinite color designations, pink, salmon, flame, etc., and substituting a definite color value.

The Fischer Color Chart dividing the three primary colors, into the six spectrum colors and subdividing each of these into the intermediate hues, greatly simplifies finding the true color index. The chart is further simplified by each intermediate hue being separated into six sections, each designating a degree or depth of color. Thus beginning with red we have from the middle circle outward the following values,—Red, Light Red, Lighter Red, Lightest Red, the latter two being commonly called pink. Inward from the same point we find Dark Red and Darker Red. Adjoining the red segment on the right is Orange Red, and on the left Violet Red, which complete the red segment. Next on the right are the Red Oranges, followed by Orange and Yellow Orange, while to the left range Red Violet, Violet and Blue violet. These intermediates are always designated by the predominating color, Orange Red which is basically Red with an Orange cast. The actual use of this chart is much simpler than the description. Use a small section of the petal, being certain the color extends definitely to the edge. A glance will decide which segment of the chart contains the basic color. Beginning with the darker shades advance the petal over the face of the chart toward the outside lighter tones, until the correct color value is found. If the correct tone cannot be matched upon the chart, then the imagination must be used to determine the indefinite color variations between any two segments of the chart. For example we find our flower is red, but does not correspond to the red section of the chart, being lighter than the red but darker than the light red section. This shading is described by using the terms Red to Light Red, indicating a degree of color lighter than Red but darker than Light Red. The so-called Salmon shades may involve a transverse description between two chart segments. Following the color segment outward we find it does not match the Lighter Orange Red, but contains too much Red to fit the Red Orange section. This value would be designated by the description Lighter Orange Red to Lighter Red Orange. As an example, a complete description of an amaryllis may be clearly given as follows,—“Eight inch compact leopoldi type, Light Red to Light Violet Red, darker veins and narrow yellow keel.”

EFFECT OF AMOUNT OF LIGHT ON AMARYLLID FLOWER COLOR

HAMILTON P. TRAUB, *Florida*

During the three day Southeastern Regional Amaryllis Show at Orlando, Florida, April 3-5, 1935, the effect of the amount of light on amaryllid flower color was plainly demonstrated. The noticeable changes were in *hue* and *value* but not in *purity*.⁴

Unfortunately the judging was delayed until the third day. By that time some remarkable color changes had taken place. In some cases, white flowers which normally would have shown very slight pink markings when expanded in full sun light or even in half shade, opened during the third day entirely white. Some types of white amaryllis which would have had a greenish throat under normal conditions were pure white. These were evident changes in color *hue*. Medium reds, under normal conditions, opened on the third day as lighter reds indicating a change in color *value*.

In recognition of the facts stated above, the Special Committee on Nomenclature and Description recommended for 1936 and 1937 that all amaryllid flowers put on exhibition be expanded in not less than half full sunlight prevailing at the season. It was fully realized that the number of sunny hours per day or even the sunny days would vary for different seasons or for various sections, and would not lead to strictly comparable results at the various shows. Such a minimum standard, however, would eliminate any attempt at "nature faking" by the method of expanding the flowers in shaded rooms prior to the exhibition, and would tend to minimize the confusion in color description that might result if no such standard were adopted. It might be advisable to indicate the light conditions and to describe the color of amaryllid flowers as they appear when opened in full sunlight as contrasted with the color when expanded in a shaded room.

Definite data on the effect of the amount of light on amaryllid flower color are being gathered and at a later date a more comprehensive paper will be prepared.

⁴Color may vary in three different ways, and these variations are the basis of the three attributes of color,—**hue**, referring to differences from White, Black and neutral Grays; **value**, referring to the holding of a position in the light-to-dark scale, and **purity**, which, in addition to **hue**, refers to the presence or absence of Gray. See "A Dictionary of Color" by A. Maerz and M. Rea Paul, First Edition, McGraw-Hill Book Co., 370 Seventh Ave., New York; London, 6 & 8 Bouverie St., E. C. 4.

3. DESCRIPTION AND PHYLOGENY

HYLINE WORSLEYI

The Genus Hyline. Under date of December 14, 1935, Mr. Arthington Worsley writes as follows regarding the *Genus Hyline*,—

“The *Genus Hyline* was established by Herbert and verified by Baker as distinguished by having linear segments, a very short staminal cup and no tube. Although it is said to have the habit of *Hymenocallis*, this may apply to its foliage only, and it is said to differ therefrom in its numerous ovules and free perianth segments. Herbert founded his *Genus* upon a dried and rather squashed specimen gathered by Gardner in October 1838 and neither in Herbert’s time nor since then has a live specimen been seen at Kew.

“The *Genus* remained monotypic until I received live plants of an unnamed species in 1895 and 1898. One of the first lot carried a flower scape in July 1895 and some of the second consignment flowered in May 1899.

“The fugacious nature of the flowers and the fact that the foliage is only distinguishable from that of many other amaryllids by one with wide experience with such plants, may account for the *Genus* being so rarely imported and hence so little known to horticulture. The important characteristic, that of its numerous ovules, justifies Dr. Hutchinson in placing the *Genus Hyline* in a separate section together with the *Genera Pamianthe*, *Stenomesson* and *Pancratium* under the *Tribe Eucharideae* in his new phylogenetic arrangement of the *Amaryllidaceae*.

“In my live plants of the new species of *Hyline*, no staminal cup was found. It is certain that the description of *Hyline Gardneriana* was made from a solitary dried specimen, which I examined at Kew. This new species is also distinguishable therefrom by its much wider leaves and segments and its fewer flowers. It grows best under the treatment given to *Eucharis grandiflora*.”

Publication of the species. In 1899, Geo. B. Mallet, who occupied the position of gardener to Mr. Worsley, published the first description of the species, which had been named for Mr. Worsley by the late W. Watson, in *Gard. Chron. Ser. III*, xxvi. 102,—

“This new species has recently flowered here, bulbs having been imported from Brazil in a case of miscellaneous **Pancratiums**. The leaves are distichous, 1½ ft. in length and 2” in width, glabrous green in color, with an acute apex. The scape is 15” high, bearing an umbel of two white flowers, each 8” long. The perianth segments each measure ½” in width, 7” in length, five of which are ascending, recurved, and interlaced, forming a singular mass; the lower segment is quite straight, half enclosing the filaments, which are in three ranks, of two each, the longest filaments reaching to the tip of the segment; the style being equally long. The general aspect of the flower is that of **Griffinia**. The flowers are singularly beautiful, and emit a faint perfume in the evening. They collapse on the second day after opening. This plant has not matured seeds. **H. Worsleyi** differs from **H. Gardneriana** in having a two-flowered umbel, a much longer flower, and much wider segments. **Hyelines** may be distinguished from **Hymenocallis** (which they much resemble out of flower) by a peculiar crackling sound given out by the leaves when handled. They require the same treatment as that afforded to **Hymenocallis**.”

With reference to Mr. Mallet’s description, on the basis of which the species was listed in the *Index Kewensis*, Mr. Worsley states that the statement “The general aspect of the flower is that of *Griffinia*” cannot be substantiated, but he is quite right in saying that the leaves, “when handled, give out a peculiar crackling sound.” In view of the fact that the original published description is lacking in certain particulars, a complete description written by Mr. Worsley specially for *Herbertia*, is here reproduced.

Hyline Worsleyi Mallet, Gard. Chron: 102. 1899

Bulbs—3" or less in diam.; deciduous or partly so, and closely resembling those of some *Hippeastrums*; offsets often numerous.

Leaves—8 to 14 appearing before the flowers, glabrous, sub-distichous and sub-prostrate; about 10" long at flowering time but elongating to double this length when mature; maximum width 2" to 2½".

Scape—Lateral or from between the leaves; edged, 8" to 14" high, bearing a pair of flowers.

Spathe—Erect, acute, 3" high; bracteoles a pair.



Arthington Worsley

Hyline Worsleyi

Pedicels—Erect, ¾" to 1¼" long.

Season of blooming—when growth of foliage is partly mature.

Flowers—Large, erect, white with greenish base, the very tips sometimes slightly ruddy; somewhat refracted from the ovary; not widely expanded; both flowers open simultaneously in the evening and close next morning. They bear some resemblance to those of *Elisena longipetala* especially on the morning after closing when all the segments are found twisted up together. During the night of expansion a slight Eucharis-like fragrance is noticeable. The span of the flower is 5" or less in some cases and up to 6" in others.

Tube—None.

Segments—6" to 7" long by $\frac{1}{2}$ " wide; the upper 5 lying together, the lowest supporting the filaments, the whole suddenly curled up at the apices. In some cases the outer segments are $\frac{5}{8}$ " wide.

Cup—None.

Stamens—Exserted, 3 longer and 2 shorter than the 6th one, straight and free, lying contiguously along the lowest segment, $5\frac{1}{2}$ " to 5" long.

Anthers— $\frac{1}{4}$ " to less than $\frac{1}{2}$ " long, versatile; pollen—yellow.

Style—6" long, sometimes spirally twisted; apex deep purple-red and ascending abruptly.

Stigma—A mere point.

Ovules—Many.

Seeds—Unknown.

Source of type plants—Ceara, Brazil.

The excellent picture of the species, *Hyline Worsleyi*, reproduced in this issue of *Herbertia* was made by Mr. Worsley in 1895, and it is the first time that this species is pictured. Mr. Worsley intended to include it in his contemplated monograph on the Amaryllidaceae, but this has been much delayed, and he decided recently to publish the picture together with a complete description of the species in *Herbertia* for 1936.

Mira Flores,
Orlando, Florida
May 11, 1936.

Hamilton P. Traub.

A NEW TEXAS COOPERIA

WYNDHAM HAYWARD

An attractive addition to the interesting Genus *Cooperia* has been observed in the trial collection of the American Amaryllis Society during early summer, 1936. The new type, which has been adjudged to be worthy of specific rank, has been given the name *Cooperia Traubii*.

There are two other species of *Cooperia*, both known for about 100 years, and well distributed in garden cultivation, *Cooperia Drummondii*, Herbert, and *Cooperia pedunculata*, Herbert. Morton, in his "Check List of the Bulbous Amaryllidaceae of the United States" (1935 Year Book, A. A. S.) gives the range of *C. pedunculata*, the largest type, as south-central Texas and parts of Mexico, and that of *C. Drummondii* as Southern Kansas, Oklahoma and Central Texas into Mexico. The new species seems to be most closely related to *C. Drummondii*.

The type specimen bloomed in the trial collection garden of the Society at Winter Park, Florida on the night of June 8, 1936 and was observed by the writer, in the course of routine inspection of the bulbs then in flower. The blooming bulb was among several donated to the trial collection by Dr. Hamilton P. Traub of Orlando, Fla., a director of the Society and editor of its Year Book (*Herbertia*). The history of the bulbs is as follows: They were collected in Brazoria County, near Angleton, Texas, southeast of Houston by Mr. R. H. Stansel for Dr. Traub's personal collection. On receipt of the bulbs during 1935, Dr. Traub presented samples to the Society's trial collection. At Angleton the bulbs grew on a grassy plain.

After careful comparison with published descriptions and with blooming specimens of the other two *Cooperias* in his garden, the writer found sufficient differences in the new type to justify its being given specific rank. It was decided to name the species *Cooperia Traubii* in honor of its donor to the Society's trial collection, mainly because of Dr. Traub's deep interest in amaryllids and in the State of Texas and Texas flowers and horticulture. He was formerly chief of the Division of Horticulture, Texas State Agricultural Experiment Station until he assumed his present position as Senior Horticulturist, with the United States Department of Agriculture in 1930.

The accompanying photographs (the type specimen; and one other specimen selected at random) will show the particular ornamental merits of this new *Cooperia*, which in many ways is a more charming flower than the other *Cooperias*, especially because of the long and slender perianth-segments.

The bulb of the new species is small, about $\frac{5}{8}$ " in diameter, and the foliage is narrow and delicate. The habit of growth is similar to that of *C. Drummondii*, and in no way does the plant resemble *Cooperia pedunculata* in a horticultural sense. *C. pedunculata* is much larger and more vigorous, both in bulb, flower and foliage. It does not resemble *C. Drummondii* var. *chlorosolen* Herb. which Baker (Amaryllideae, 1888) characterizes as follows: "Perianth-tube stouter, tinged with green; limb longer, less rotate. Leaves a little broader". The limb of *C. Traubii* is not at all rotate. The foliage of *C. Traubii* is smaller than that of *Drummondii*, but the flower is larger when fully opened. The color is the same as in the others, pure white, with only a faint tinge of pinkish red on the reverse of the petals. This reddish coloring is much stronger in *C. Drummondii*. The general appearance of the flower is quite star-like. The tube is long, nearly 5 inches. The petals, long and narrow, are a brilliant and gleaming white. The entire flower is approximately $2\frac{1}{2}$ inches across the diameter of the face when wide open.

The principal botanical point on which *Cooperia Traubii* is proposed as a new species is the form of the petals and the general size and structure of the perianth. The anthers of *C. Traubii* are erect, characteristic of the *Cooperias*. The flowers open in the early evening and remain in good condition through the next morning and longer since the type specimen was gathered at 10 A. M. June 9, 1936, and was then in excellent condition.

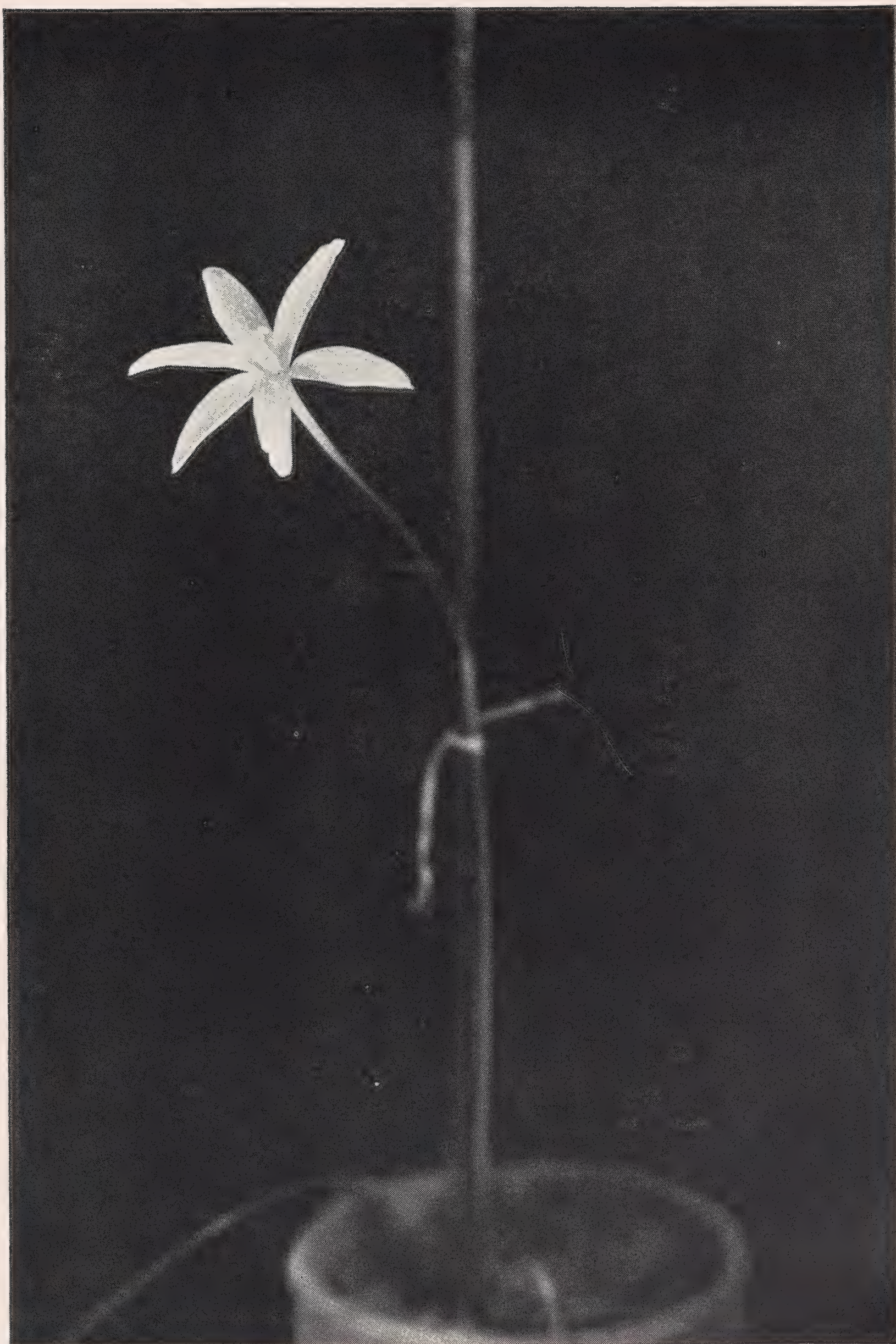
COOPERIA **TRAUBII**, new species

Bulb globose, $\frac{5}{8}$ inch diameter; neck 1 inch; leaves about 4, narrowly linear, glaucous, drooping, up to 9" long and contemporaneous with the flowers; peduncle slender, fragile, hollow, 7 to $7\frac{1}{2}$ inches long; spathe valve 1 and $\frac{3}{4}$ inches long; ovary sessile; perianth tube long, $4\frac{3}{4}$ to 5 inches, limb $1\frac{1}{4}$ inches long; segments pure white with faint tinge of reddish pink on reverse, long and slender, $\frac{3}{16}$ to $\frac{1}{4}$ inch broad; anthers $\frac{1}{4}$ to $\frac{3}{8}$ inch long, erect; style projects so that stigma is $\frac{3}{8}$ inch above the anthers. Type specimen collected June 9, 1936 at Lakemont Gardens, Winter Park, Florida, from bulbs secured by Dr. Hamilton P. Traub from Angleton, Texas and donated to the Trial Collection of the American Amaryllis Society. At Angleton the bulbs grew profusely on a grassy plain. The type specimen, (Hayward No. 101) has been deposited in the United States National Herbarium, Smithsonian Institution, Washington, D. C.

COOPERIA **TRAUBII**, species nova

Bulbous globosus, 1.6 cm. diametro, collo 2.5 cm. longo; folia ca. 4, auguste linearia, glauca, decurvata, usque ad 22.5 cm. longa; pedunculus gracilis, fragilis, fistulosus, 17.5-19 cm. longus; spathae valva 4.4 cm. longa; ovarium sessile; tubus perianthii elongatus, 12-12.7 cm. longus, segmentis albis, externe pallide rubescentibus, tenuibus, 3.2 cm. longis, 5-6.5 mm. latis; antherae 6.5-10 mm. longae, erectae; stylus quam stamina 10 mm. longior.

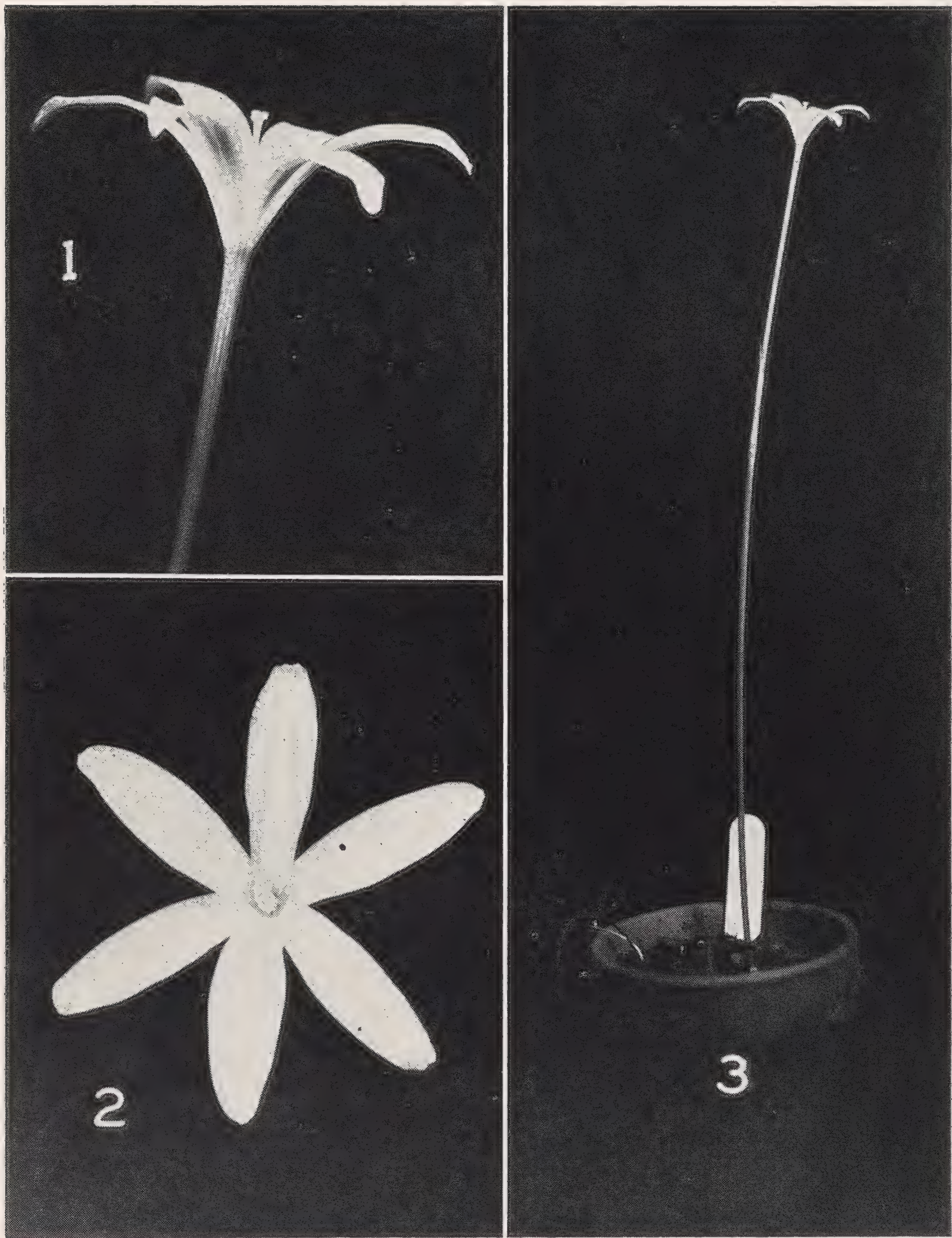
June 9, 1936
Lakemont Gardens,
Winter Park, Florida



Wyndham Hayward

Cooperia Traubii, sp. nov.

The type plant



Chas. T. O'Rork, Jr.

Cooperia Traubii

Figs. 1 and 2, side and top view of flower, natural size; Fig. 3, entire plant, 3/10 natural size; plant selected at random.

AMARYLLIDACEAE
NATIVE TO THE UNION OF SOUTH AFRICA

R. H. COMPTON, *Director*,
National Botanic Gardens, Kirstenbosch,
Union of South Africa

The following catalogue of South African Amaryllidaceae is arranged according to Dr. Hutchinson's system—

*AGAPANTHEAE*¹

1. *AGAPANTHUS*¹
2. *TULBAGHIA*¹

ALLIEAE—Not represented

GILLIESIEAE—Not represented

GALANTHEAE—Not represented

AMARYLLIDEAE

3. *AMARYLLIS*, Linn.

1. *Amaryllis Belladonna*, Linn.

4. *BRUNSVIGIA*, Heist.

1. *Burnsvigia Josephinae*, Gawl.
2. " *grandiflora*, Lindl.
3. " *Slateriana*, Benth.
4. " *minor*, Lindl.
5. " *gigantea*, Heist.
6. " *Cooperi*, Bak.
7. " *sphaerocarpa*, Bak.
8. " *striata*, Ait.
9. " *natalensis*, Bak.
10. " *Radula*, Ait.
11. " *radulosa*, Herb.
12. " *undulata*, Leighton.
13. " *appendiculata*,
Leighton.
14. " *Bosmaniae*, Leigh-
ton.

5. *NERINE*, Herb.

1. *Nerine sarniensis*, Herb.
2. " *curvifolia*, Herb.
3. " *Moorei*, Leichtl.
4. " *flexuosa*, Herb.

5. *Nerine angustifolia*, Bak.
6. " *pudica*, Hook f.
7. " *brachystemon*, Bak.
8. " *filifolia*, Bak.
9. " *undulata*, Herb.
10. " *humilis*, Herb.
11. " *appendiculata*, Bak.
12. " *pancratioides*, Bak.
13. " *lucida*, Herb.
14. " *duparquetiana*, Bak.
15. " *marginata*, Herb.
16. " *Schlechteri*, Bak.
17. " *Bowdeni*, W. Watson
18. " *falcata*, Bak.
19. " *Frithii*, L. Bolus.
20. " *Masonorum*, L. Bolus.
21. " *Ridleyi*, Phillips.
22. " *Huttonii*, Schonl.
23. " *angulata*, L. Bolus.
24. " *Rehmanni*, L. Bolus.
25. " *Krigei*, Barker.
26. " *Peersii*, Barker.
27. " *alta*, Barker.
28. " *tulbaghensis*, Barker.
29. " *Breachiae*, Barker.
30. " *filamentosa*, Barker.

¹Represented in South Africa but no information furnished due to an oversight on part of editor in not requesting it.

CRINEAE

6. CRINUM, Linn.

1. *Crinum lineare*, Linn, f.
2. " *variabile*, Herb.
3. " *campanulatum*, Herb.
4. " *imbricatum*, Bak.
5. " *Moorei*, Hook. f.
6. " *longifolium*, Thunb.
7. " *MacOwani*, Bak.
8. " *Bainesii*, Bak.
9. " *crispum*, Phill.

7. AMMOCHARIS, Herb.

1. *Ammocharis falcata*, Herb.
2. " *coccinea*, Pax.
3. " *Traveliana*
4. " *Herrei*, Leighton.

8. CYRTANTHUS, Ait.

1. *Cyrtanthus obliquus*, Ait.
2. " *carneus*, Lindl.
3. " *Elliotii*, Bak.
4. " *Huttoni*, Bak.
5. " *brachyscyphus*, Bak.
6. " *parviflorus*, Bak.
7. " *Flanagani*, Bak.
8. " *stenanthus*, Bak.
9. " *collinus*, Gawl.
10. " *spiralis*, Burch.
11. " *pallidus*, Sims.
12. " *rectiflorus*, Bak.
13. " *MacOwani*, Bak.

14. *Cyrtanthus O'Brieni*, Bak.

15. " *odorus*, Gawl.
16. " *angustifolius*, Ait.
17. " *striatus*, Herb.
18. " *Tuckii*, Bak.
19. " *lutescens*, Herb.
20. " *Mackenii*, Hook. f.
21. " *uniflorus*, Gawl.
22. " *belictus*, Lehm.
23. " *vittatus*, Desf.
24. " *sanguineus*, Hook.
25. " *Galpinii*, Bak.
26. " *Junodii*, Beauw.
27. " *leucanthus*, Schltr.
28. " *epiphyticus*, Wood.
29. " *Guthrieae*, L. Bolus.
30. " *contractus*, N. E. Br.
31. " *rotundilobus*, N. E. Br.
32. " *Stayneri*, L. Bolus.
33. " *flavus*, Barnes.
34. " *Fergusoniae*, L. Bolus.
35. " *inaequalis*, O'Brien.
36. " *Balenii*, Phillips.

9. ANOIGANTHUS, Baker.²

1. *Anoiganthus brevifolius*, Bak.

10. VALLOTA, Herb.

1. *Vallota purpurea*, Herb.

ZEPHYRANTHEAE

11. APODOLIRION, Baker.

1. *Apodolirion lanceolatum*, Benth
2. " *Ettae*, Bak.
3. " *Buchanani*, Bak.
4. " *Bolusii*, Bak.
5. " *MacOwani*, Bak.
6. " *Mackenii*, Bak.

12. GETHYLLIS, Linn.

1. *Gethyllis spiralis*, L. F.
2. " *verticillata*, R. Br.
3. " *villosa*, L. f.
4. " *longistyla*, Bolus.
5. " *pusilla*, Bak.
6. " *afra*, L.
7. " *britteniana*, Bak.
8. " *ciliaris*, L. f.
9. " *latifolia*, Masson.
10. " *undulata*, Herb.
11. " *Herrei*, L. Bolus.

12. *Gethyllis lata*, L. Bolus.

13. " *campanulata*, L. Bolus.
14. " *grandiflora*, L. Bolus.
15. " *linearis*, L. Bolus.
16. " *unilateralis*, L. Bolus.
17. " *multifolia*, L. Bolus.
18. " *longituba*, L. Bolus.
19. " *setosa*, Marl.
20. " *languinosa*, Marl.
21. " *verrucosa*, Marl.

²Not listed by Dr. Hutchinson.

HAEMANTHEAE

13. HESSEA, Herb.

1. *Hessea stellaris*, Herb.
2. " *crispa*, Herm.
3. " *Zeyheri*, Bak.
4. " *brachycypha*, Bak.
5. " *filifolia*, Benth.
6. " *spiralis*, Bak.
7. " *gemmata*, Benth.
8. " *Mathewsii*, Barker.
9. " *Leipoldtii*, L. Bolus.
10. " *Karooica*, Barker.
11. " *unguiculata*, Barker.
12. " *dregeana*, Kunth.

14. CARPOLYZA, Salisb.

1. *Carpolyza spiralis*, Salisb.

15. STRUMARIA, Jacq.

1. *Strumaria truncata*, Jacq.
2. " *linguaeifolia*, Jacq.
3. " *angustifolia*, Jacq.
4. " *Watermeyerii*, L. Bolus.
5. " *rubella*, Jacq.
6. " *undulata*, Jacq.

16. BUPHANE, Herb.

1. *Buphane longipedicellata*, Pax.
2. " *disticha*, Herb.
3. " *ciliaris*, Herb.

17. CLIVIA, Lindl.

1. *Clivia nobilis*, Lindl.
2. " *Gardneri*, Hook.
3. " *miniata*, Regel.

18. HAEMANTHUS, Linn.

1. *Haemanthus Katharinae*, Bak.
2. " *puniceus*, L.
3. " *natalensis*, Pappe.
4. " *magnificus*, Herb.
5. " *Pumilio*, Jacq.
6. " *lanceaefolius*, Jacq.
7. " *carneus*, Gawl.
8. " *amarylloides*, Jacq.
9. " *montanus*, Bak.
10. " *candidus*, Bull.
11. " *albiflos*, Jacq.
12. " *albomaculatus*, Bak.
13. " *Baurii*, Bak.
14. " *Arnottii*, Bak.
15. " *deformis*, Hook.
16. " *Mackenii*, Bak.
17. " *Cooperi*, Bak.
18. " *hirsutus*, Bak.
19. " *incarnatus*, Burch.
20. " *undulatus*, Herb.
21. " *concolor*, Herb.
22. " *sanguineus*, Jacq.
23. " *Hookerianus*, Herb.
24. " *humillis*, Jacq.
25. " *rotundifolius*, Gawl.
26. " *callosus*, Burch.
27. " *moschatus*, Jacq.
28. " *coccineus*, L.
29. " *tigrinus*, Jacq.
30. " *hyalocarpus*, Jacq.
31. " *crassipes*, Jacq.
32. " *pubescens*, L. f.
33. " *sacculus*, Phillips
34. " *Ryderae*, Barnes.

IXIOLIRIONEAE—Not represented**EUCHARIDEAE**19. KLINGIA³**EUSTEPHIEAE**—Not represented**HIPPEASTREAE**—Not represented**NARCISSEAE**—Not represented

³Imperfectly known Genus reported by Dr. Hutchinson as represented in Namaqualand.



Dr. H. Pittier, Caracas, Venezuela

Hippeastrum equestre

Habitat, Los Mariches, near Petare and Caracas, Venezuela

AMARYLLIDACEAE OF BRITISH GUIANA

HON. E. B. MARTYN, *Government Botanist*
and *Superintendent of Botanic Gardens, Georgetown,*
British Guiana

The following named indigenous amaryllids are represented in our herbarium;

Crinum Commelyni Jacq.
C. erubescens Ait.
Hippeastrum equestre Herb.
H. solandriflorum Herb.

Hymenocallis caribaea Herb.
H. tubiflora Salisb.
Furcraea gigantea Vent.

In addition to these, Schomburgk's "Fauna and Flora of British Guiana" lists the following;

Amaryllis belladonna L.⁴
Bomarea edulis Herb.
B. fuscata Kl.
Crinum viridiflorum M. J. Roem.
C. guianense M. J. Roem.
Hippeastrum barbatum Herb.

Hippeastrum occidentale M. J. Roem.
Hymenocallis amoena Herb.
H. Dryandii M. J. Roem.
H. fragrans M. J. Roem.
H. guianensis Herb.
H. sloanei M. J. Roem.

Pulle's "Flora of Surinam" includes the following;

Crinum scabrum Sims.
Hymenocallis obtusata (Griesb.) Pulle.

Hypoxis decumbens L.

The only species of *Hippeastrum* readily available is *H. equestre*. The other species listed are rare on the coastlands or near Georgetown. As regards the species listed by Schomburgk, many of these were obtained inland and in the savannah areas where collections are seldom made.

BULBOUS AMARYLLIDACEAE OF VENEZUELA

DR. H. PITTIER, *Venezuela*

The following list includes the bulbous amaryllids reported as growing in Venezuela;

Bomarea bredemeyeriana (Willd.) Herb. Coast Range, Andes of Mérida.
B. polyantha Kraenzlin—Cerro de Avila (Coast Range).
B. hispida Baker—Andes of Mérida.
B. caraccensis Herb.—Vicinity of Caracas.
Hippeastrum equestre (*H. puniceum* Lam.) Herb.—Appears in spontaneous colonies in certain savannas of the lower belt.
H. solandriflorum Bot. Reg.—Abundant in certain savannas up to 1300m.
Hymenocallis caribaea (L.) Bot. Reg.—Island of Margarita.
H. moritziana Kunth—Reported from the vicinity of Caracas.
H. pedalis Bot. Reg.—Andes of Trujillo.
H. undulata Bot. Reg.—Lower belt, up to 1000m.; also cult.
Eucharis grandiflora Pl.—Andes and often cultivated.
Zephyranthes tubispatha (L'Hér.) Bot. Reg.—Temperate belt, scattered and often in cultivation.

⁴This apparently refers to plants under cultivation.

Crinum erubescens Ait.—Seldom seen in wild condition, but often in gardens.

C. graciliflorum Kunth.—In savannas near Caracas and also collected near Maracaibo by Moritz.

C. graciliflorum var. *Fendleri* Baker—Colonia Tovar (Coast Range).

As a rule, the amaryllids grow very scattered and are seldom met with. The only exception is *Hippeastrum solandriflorum* which is very abundant in some savannas. In the country around my home, a few miles from Caracas, we have *Hippeastrum equestre* (*puniceum* Lam.), of which I am sending a photograph for reproduction in the Year Book.

In the future, knowing that your Society is especially interested, I shall pay more attention to the amaryllids.

BULBOUS AMARYLLIDACEAE OF PERU

J. FRANCIS MACBRIDE

Field Museum, Chicago, Ill.

Distrepta vaginata Miers. Department of Lima at 400 meters. Plants with one to three blue flowers.

Zephyranthes Briquetii Macbride. Known only from Carumas, Department of Moquehua. Flowers white.

Zephyranthes flava (Herb.) Baker. Known only in cultivation from material sent from Lima in 1834. Flowers yellow.

Zephyranthes gracilis Herbert. Collected long ago by Ruiz at Puerto de Santa Maria. Flowers white (?).

Zephyranthes parvula Killip. Known only from the Department of Cuzco, at 3500 meters. Flowers pink. Called Pulla-pulla.

Zephyranthes tubiflora (L'Hér.) Schinz. Said to be common on the hills about Lima, and one of the most handsome flowers of the coastal hills during the green season. Flowers yellow.

Zephyranthes tubiflora var. *flammea* (R. & P.) Macbride. Region of Lima. Flowers flame-colored.

Cooperia albicans (Herb.) Sprague. Growing on sandhills in the Department of Arequipa, flowering in October. Flowers white.

Crocopsis fulgens Pax. In the Andes at 3300-4200 meters. A crocus-like plant, the solitary flower orange and black-dotted.

Cblidanthus fragrans Herbert. Flowers bright yellow. Known from the departments of Amazonas, Arequipa, and Tacna. Also in Ecuador and Argentina.

Crinum undulatum Hooker. Reported from the lowlands on the eastern side of the Andes. Also in Brazil.

Hymenocallis Amancaes (R. & P.) Nichols. Flowers yellow. A festival called Amancaes Day is celebrated at Lima when this plant is in bloom, covering the semi-desert hillsides of the vicinity with thousands of brilliant blossoms. The plant is known only from the Lima region, where it is called *Amancaes*.

Hymenocallis deflexa (Herb.) Baker. Known only in cultivation, a hybrid between *H. narcissiflora* and *H. longipetala*.

Hymenocallis longipetala (Lindl.) Macbride. Departments of Lima and Cuzco. Called Tamancay. Flowers white, as in the other species listed here except *H. Amancaes*.

Hymenocallis narcissiflora (Jacq.) Macbride. Said to be a native of Peru.

Hymenocallis nutans (Herb.) Baker. Perhaps of Peruvian origin.

Hymenocallis pedunculata (Herb.) Macbride. A native of Peru, the region not known.

Hymenocallis quitoensis Herbert. Collected in the Department of Tumbes. Also in Ecuador.

Hymenocallis ringens (R. & P.) Macbride. Probably Peruvian, but known only in cultivation.

Hymenocallis sublimis (Herb.) Macbride. Department of La Libertad.

Eucharis Bakeriana N. E. Brown. Lowlands of the Department of Loreto. Also in Colombia.

Eucharis Castelnaeana (Baill.) Macbride. Known only from Pampa del Sacramento, Department of Loreto.

Eucharis galanthoides (Klotzsch) Planch. & Linden. Described from Paita, Department of Piura.

Eucharis grandiflora Planch. & Linden. Frequent in the eastern foothills of the Andes. Also in Columbia. Called Amancay.

Eucharis narcissiflora Huber. Apparently frequent in the department of Junin and Loreto.

Eucharis Ulei Kraenzlin. Lowlands of the Department of Loreto. Also in adjacent Brazil.

Stenomesson aurantiacum (HBK.) Herbert. Departments of Lima, Cajamarca, and Cuzco, at high elevations. Also in Ecuador. Flowers yellow.

Stenomesson coccineum (R. & P.) Herbert. Department of Junin, Huánuco, Lima, Ancash, and Cuzco. Flowers bright or salmon or cinnamon red; rarely rose-colored (*S. breviflorum* Herb.).

Stenomesson croceum (Savigny) Herbert. Region of Lima. Flowers pale yellow.

Stenomesson Elwesii (Baker) Macbride. Known only in cultivation; similar to *S. viridiflorum*.

Stenomesson humile (Herb.) Baker. At high elevations, Junin, Cuzco, and Ancash. Flower orange-red.

Stenomesson incarum Kraenzlin. Department of Arequipa. Flowers red.

Stenomesson latifolium Herbert. Lima and Cuzco. Flowers yellow.

Stenomesson longifolium Kraenzlin. Departments of Lima and Arequipa. Flowers red.

Stenomesson luteum (Herb.) Baker. Known only from some uncertain locality in Peru. Flowers yellow.

Stenomesson Macleanicum (Herb.) Macbride. Department of Lima, at 3500 meters. Flowers yellow.

Stenomesson pauciflorum (Lindl.) Herbert. Introduced into cultivation from Peru. Flowers golden yellow.

Stenomesson pauciflorum var. *curvidentatum* (Herb.) Macbride. Introduced into cultivation from Peru in 1825.

Stenomesson Pearcei Baker. Departments of Cuzco, Junin, and Puno, at high elevations. Flowers yellow.

Stenomesson recurvatum (R. & P.) Baker. Region of Lima. Flowers reddish yellow.

Stenomesson suspensum Baker. Department of La Libertad. Flowers bright scarlet.

Stenomesson variegatum (R. & P.) Macbride. Departments of Amazonas and Cuzco. Flowers pale or bright red.

Stenomesson viridiflorum (R. & P.) Benth. & Hook. Department of Junin. Flowers emerald green.

Stenomesson vitellinum Lindley. Introduced into cultivation from Lima.

Hippeastrum Forgetii Worsley. Region of Cuzco.

Hippeastrum fuscum Kraenzlin. Department of Puno.

Hippeastrum Leopoldii (Moore) Dombrain. Collected somewhere in Peru by Pearce.

Hippeastrum miniatum (R. & P.) Herbert. Departments of Cuzco and Huánuco.

Hippeastrum pardinum (Hook. f.) Dombrain. Collected somewhere in Peru by Pearce.

Hippeastrum puniceum (Lam.) Urban. Departments of Puno, Loreto, and Junin. A species of wide distribution.

Hippeastrum reginae (L.) Herbert. Department of Junin.

Hippeastrum solandriflorum Herbert. Department of Cuzco. A species of wide distribution.

Hippeastrum vittatum (L'Hér.) Herbert. Said to be native of the Peruvian Andes.

Urceolina fulva Herbert. Type collected at Parahuanka. Flowers yellow.

Urceolina latifolia (R. & P.) Benth. & Hook. Department of Junin. Flowers yellow or reddish, tipped with green and white.

Urceolina microcrater Kraenzlin. Department of Huánuco, at 1200-1600 meters. Flowers yellow.

Urceolina peruviana (Presl) Macbride. Of rather wide distribution in the Andes, at high elevations. Flowers scarlet or reddish yellow.

Urceolina urceolata (R. & P.) Asch. & Graebn. Departments of Huánuco, Junin, and Cuzco. Flowers bright yellow and green.

Phaedranassa Carmioli Baker. Reported from Cuzco, at 3450 meters.

Phaedranassa megistophylla Kraenzlin. Department of Cajamarca at 500 meters. Flowers blue-green.

Phaedranassa viridiflora Baker. Department of Cajamarca. Flowers greenish yellow, with green tips.

Eucrosia eucrosioides (Herb.) Pax. A native of Peru, but the region not known. Flowers green, with scarlet limb.

Eustephia armifera Macbride. Department of Cuzco, at 3100 meters. Flowers blood-red outside, yellowish within.

Eustephia coccinea Cav. Departments of Cuzco, Huánuco, and Junin, at 2200-3400 meters. Flowers bright red, tipped with green.

BULBOUS AMARYLLIDACEAE KNOWN FROM COSTA RICA

PAUL C. STANDLEY

Associate Curator, Field Museum, Chicago, Ill.

Crinum cruentum Ker. Growing in wet places at low elevations. Also grown frequently in gardens.

Crinum erubescens Solander. Frequent in cultivation, also probably naturalized in some localities, as often is the case with this species in Central America.

Crinum longiflorum Herbert. Common in gardens, especially at low elevations, and probably naturalized in some parts of the *tierra caliente*.

Eucharis grandiflora Planchon. Vernacular name *Eucaristo*. Flowers white, fragrant, about 7 cm. long. Of Colombian origin, frequently planted in Costa Rican gardens.

Eucharis himeroessa Sandwith, ined. Of this unpublished species I have seen only a few flowers. It was collected at El Rodeo, Costa Rica, by Mr. C. H. Lankester, and has been cultivated in the Royal Botanic Gardens, Kew. The flowers are smaller than those of *E. grandiflora*. This is the only species of the genus that has been found wild north of Colombia.

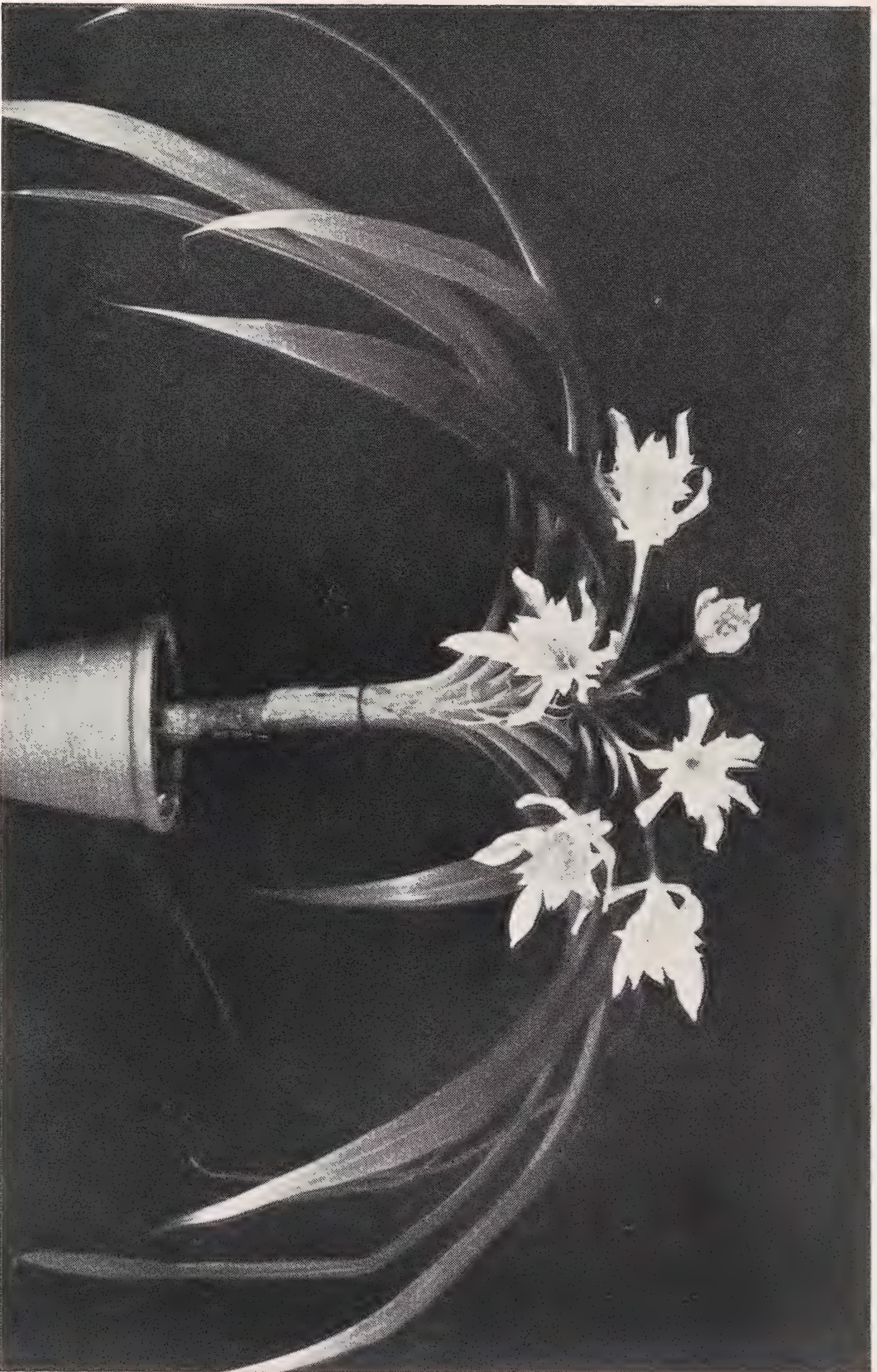
Hippeastrum reginae Herbert. A common ornamental garden plant, native of South America.

Hymenocallis littoralis (Jacq.) Salisb. Frequent in wet or swampy places of the lowlands, often or usually growing on sea beaches.

Phaedranassa Carmioli Baker. This species was based upon plants grown in England by Wilson Saunders in 1867 from bulbs sent from Costa Rica by Julio Carmiol. It is illustrated in plate 8356 of *Curtis' Botanical Magazine*. Little seems to be known of the plant, but I found it in 1925 growing in a garden at Santa Maria de Dota, Costa Rica. It is by no means certain that it is a native of Costa Rica, the other species of the genus being South American. The plant is a very handsome one, with petioled lanceolate leaves. The flowers, in umbels, are tubular, pale red, the lobes of the perianth being green. The plant is well worthy of wide cultivation.

Polianthes tuberosa L. Vernacular name Nardo. Cultivated commonly in gardens, as in Central America generally. Native of Mexico. The cultivated plants always have double flowers.

Zephyranthes carinata (Spreng.) Herbert. Called Lágrimas de Maria ("tears of the Virgin"). Cultivated commonly in gardens, also naturalized in meadows and in grassland generally at middle elevations. Perhaps native.



Major A. Pam

Pammianthe peruviana



Major A. Pam

Hymenocallis quitoënsis

BULBOUS AMARYLLIDACEAE OF BRITISH HONDURAS

PAUL C. STANDLEY

Associate Curator, Field Museum, Chicago, Ill.

Crinum cruentum Ker. In cultivation; also apparently naturalized in some localities.

Hippeastrum puniceum (Lam.) Urban. Known locally as Amaryllis and Adonis. Cultivated in gardens and perhaps naturalized in some places.

Hymenocallis littoralis (Jacq.) Salisb. Growing in swamps and on seashores.

Polianthes tuberosa L. Grown commonly in gardens.

THE GENUS PAMIANTHE

The following catalog of the *Genus Pamianthe* was kindly furnished by the Gray Herbarium, Harvard University. The illustrations of *Pamianthe peruviana* and *P. quitoensis*⁵ reproduced in this issue of *Herbertia*, were furnished by Major A. Pam. Your attention is also directed to the illustration of *P. peruviana* which appeared in the 1935 Year Book.

PAMIANTHE Stapf

Gard. Chron. ser. 3,93:106, Feb. 11, 1933.
Curtis's Bot. Mag. 146, tab. 9315. July 1, 1933.

Pamianthe peruviana Stapf. Peru

P. Andreana Stapf. (*Ismene Andreana* Baker)

P. quitoënsis Stapf. (*Hymenocallis quitoënsis* Herb.)⁵

AMARYLLIDS OF THE NETHERLANDS EAST INDIES

The following list of amaryllids native to the islands of Java, Amboina, and the remaining Netherlands East Indies has been prepared for *Herbertia* by the Director of the Royal Botanic Gardens,⁶ at Buitenzorg, Java, one of the great Botanic Gardens of the tropics.

Crinum asiaticum, L.; indigenous to Java, Madoera, and Kangean.

Eurycles amboinensis, Loud.; Java, Kangean, and Amboina.

Eurycles alba, Backer; New Guinea.

Pancratium zeylanicum, L., Java.

Curculigo orchioides, Gaertn., Java, Madoera and other islands.

Curculigo capitata, O. K.; E. and W. Java, and some other islands.

Curculigo latifolia, Dryand.; West and Central Java.

Hypoxis aurea, Lour.; Central and East Java.

The director of the Buitenzorg Gardens adds that "nearly all the ornamental amaryllidaceae are cultivated in the mountain regions of Java, including hybrid *Hippeastrums*."

⁵Word has just been received, July 1, 1936, from Major Pam to the effect that this species has set seeds which are green in color. The species must therefore be transferred back to the **Genus Hymenocallis**.—Hamilton P. Traub.

⁶Dr. K. W. Dammerman, Director; Mr. P. Dakkus, Curator.

THE AMARYLLIDACEAE OF TEXAS

V. L. CORY, *Range Botanist*,
Texas Agric. Expt. Station, Substa. 14, Sonora, Texas

Zones of distribution are geographically considered as follows: (1) The timber belt (East Texas); (2) The coastal prairie (Southeast Gulf Coast); (3) The Rio Grande plains (lying chiefly between the Rio Grande and the Edwards plateau); (4) The Prairies (Central Texas); (5) The Edwards plateau; (6) The Trans-Pecos (West of the Pecos River); (7) The Plains (The high plains and rolling plains of Northwestern Texas.).

The list is arranged according to Dr. Hutchinson's system,—

TRIBE 2. ALLIEAE

	Zones of Distribution
1 <i>Allium canadense</i> L.	1-2-4
2 <i>A. cernuum</i> Rath (<i>A. recurvatum</i> Rybd.) These may be distinct	6
3 <i>A. Coryi</i> M. E. Jones	6
4 <i>A. deserticola</i> , (M. E. Jones) Woot. & Standl.,	6
5 <i>A. Drummondi</i> Regel (<i>A. Helleri</i> Small)	4-5-7
6 <i>A. mobilense</i> Regel (<i>A. arenicola</i> Small; <i>A. microscordion</i> Small)	1-2-3-4-5-7
7 <i>A. mutabile</i> Michx.	1-3-4-5-7
8 <i>A. nevadense</i> S. Wats	4-5-6-7
9 <i>A. Nuttalli</i> S. Wats	3-4-5-6-7
10 <i>A. reticulatum</i> Fraser ex Don	6
11 <i>A. sceaposum</i> Benth	3-4-5
12 <i>A. stellatum</i> Fraser ex Ker	6-7
13 <i>Nothoscordum</i> bivalve (L.) Britton	1-2-3-4-5-6-7
14 <i>Brodiaea coerulea</i> (Scheele) Macbride	4-5-7
15 <i>B. uniflora</i> (Lindl.) Engler Possibly not established; cultivated	4
16 <i>Milla biflora</i> Cav.....	6

TRIBE 6. CRINEAE

17 <i>Crinum americanum</i> L.	1
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TRIBE 7. ZEPHYRANTHEAE

18 <i>Zephyranthes candida</i> Lindl.....	2
19 <i>Z. chrysantha</i> Greenm. & Thompson (near Brownsville)	3
20 <i>Z. longifolia</i> Hemsl	6
21 <i>Z. pulchella</i> J. G. Smith (near Corpus Christi)	3
22 <i>Z. texana</i> Herb.	1-2-3-4
23 <i>Cooperia Drummondi</i> Herb.	4-5-7
24 <i>C. pedunculata</i> Herb.	1-4-5

TRIBE 10. EUCHARIDEAE

25 <i>Hymenocallis galvestonensis</i> Baker	2
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Mr. Cory writes, under date of April 24, 1936,—“I wish to call particular attention to No. 3 in this list, not because it is named after me, but because it is one of the few yellow-flowered onions, and because it appears probable that it will

become a desirable species for growing under cultivation as an ornamental plant. . . . Regarding No. 15, it seems probable that this species is all right for growing under cultivation in Florida, but to what extent it is being grown in Texas, I do not know. I have seen it only in yards at Gonzales, where it maintains itself but so far has not escaped from cultivation. . . . I may say that I have never collected No. 16 which is said to grow in the mountains of western Texas. . . . Mr. Park is growing at San Antonio a *Zephyranthes* we collected last fall in Kinney County. This is a yellow-flowered species and it may be *Z. chrysantha*."

AMARYLLIDACEAE OF CEYLON

T. H. PARSONS, *Curator*

Royal Botanic Gardens, Paradeniya, Ceylon

CRINUM L.

1. *Crinum asiaticum* L. Tolabo S. sandy sea coast of moist regions; common, sweet scented; also in India.
2. *C. defixum* Ker. Hin-tolabo S.; low country streams and wet places; common throughout India.
3. *C. latifolium* L. *var. zeylanicum*. Tolabo s.; damp places in low country; common throughout eastern tropics; a very variable species.

PANCRATIUM L.

4. *Pancratium zeylanicum* L. Wal-lunu s.; low country in grassy places, common, fragrant; throughout tropical Asia; bulb used medicinally (recent correction,—“perianth-tube about 2 in., staminal cup broad”).
5. *P. verecundum* Sol. Distribution as above; (recent correction,—“perianth-tube about 3 in.; staminal cup narrow”).
6. *P. triflorum* Roxb. Distribution as above; (recent correction,—“perianth-tube about 6 in.; staminal cup broad”).

TWO NEHRLING HYBRID CRINUMS

WYNDHAM HAYWARD, *Florida*

Two hybrid crinum varieties introduced some years ago by the late Henry Nehrling and now exceedingly rare have flowered at Lakemont Gardens in March of the present year.

One of the varieties is named *Mrs. James Hendry*, in honor of the wife of the outstanding nurseryman in Ft. Myers, Fla. A photographic reproduction of this variety is included among the plates in this issue. The flower has a delightful perfume and the coloring varies from a purple rose on the unopened buds to a pinkish white which fades to nearly white when the flower matures. The flowers are borne in a large umbel, and open several at a time, about three-fourths opening in two days. The plant is vigorous and grows in the full sun in rich soil. Although it is a slow propagator naturally, the cuttage method will overcome this difficulty.

The other variety is named *Sophia Nehrling* and is similar to *Mrs. James Hendry* except that the petals are more pointed, the cups of the flowers smaller,



Wyndham Hayward

Hybrid Crinum, Mrs. James Hendry

there are fewer flowers in the umbel, and the general appearance of the bloom cluster is apparently not as outstanding. The variety *Sophia Nehrling* was the first hybrid crinum variety introduced by Mr. Nehrling; *Mrs. James Hendry* was raised some years later.

CRINUMS WHITE QUEEN AND POWELLI ALBUM

WYNDHAM HAYWARD, *Florida*

Actual comparison of the flowers of the two pure white hybrid crinums, *White Queen* and *Powellii album*, made from authenticated specimens blooming in the writer's garden in Winter Park during May, 1936, shows considerable similarity between the two types and in addition several distinguishing characteristics. The origin of *Powellii album* is apparently not known, but it is without doubt the best known of the hybrids grown today.

The Standard Cyclopaedia of Horticulture does not list the year of introduction or the hybridizer's name under *Crinum Powellii*, and merely mentions the white variety *album*. It is one of the showiest and most satisfactory garden varieties, besides being quite hardy with winter protection farther north.

White Queen is a hybrid crinum offered the trade by Mr. W. H. Henderson of Fresno, California. The foliage is quite different from that of *Powellii*, being of the rotary type, while the leaves of *Powellii* stand out in two main directions, with only a slight rotary tendency. The bulb of *White Queen* is apparently somewhat larger at base and neck than *Powellii*.

Three outstanding differences in *White Queen* are noted as follows: the petals are strongly recurved at the tips, bending back on themselves until they touch and more. The tube of the flower is longer than that of *Powellii album*. The texture of the *White Queen* petals is more delicate and glistening than in the case of the *Powellii* blooms.

The recurved petals give the *White Queen* bloom umbel a charming character all its own. The tube of the flowers or "neck" is about an inch longer than that of *Powellii album*, the measurements being $4\frac{1}{4}$ inches for *White Queen* and 3 inches for *Powellii album* in the specimens examined. This length of tube gives the Henderson crinum flowers a more pendulous habit in the bloom cluster. The pedicel length is about the same in both cases, being under an inch. The perfume of neither flower is particularly pleasant, but that of *Powellii* is slightly better than the other.

The *Powellii* flower petals are glossy and more porcelain-like in their texture than the other, but the *White Queen* petals are of a peculiar glistening white, like frosted glass, and sparkling under strong light in the evening, while the *Powellii* petal texture shines. There is less green in the throat of the Henderson crinum, and it also produces larger scapes and more flowers to the individual umbel.

The *Powellii* parentage is *C. longifolium* X *C. Moorei*, but the parentage of the Henderson crinum is not recorded. In broad noon daylight, the flowers of *Powellii* stand up with slightly better appearance, full warmth of the sun forcing the blooms of both varieties to droop. Few crinum blooms can stand the full blaze of the sub-tropical sun without suffering in appearance. The flowers are best viewed in the early morning, at evening, and under artificial light at night, when they really seem at their best.



Wyndham Hayward

Hymenocallis floridana

AMERINDIAN LILIES (HYMENOCALLIS) IN FLORIDA

WYNDHAM HAYWARD, *Florida*

The *Hymenocallis* group is an outstanding example in the Amaryllis Family of a genus that is horticulturally interesting and highly ornamental, but which is at present suffering from undeserved neglect on the part of flower lovers and bulb fanciers.

Not more than two or three species out of the forty or so recorded are ever seen in ordinary cultivation in the United States, and perhaps half a dozen more types are rarely met with in unexpected places and collector's gardens. The *Hymenocallis* group is one of distinct character and beauty, and highly desirable for pot culture in the north and outdoors in warm climates.

Some of the species, in the *Ismene* section, are deciduous, and are grown in the north as are gladioli, being stored inside during the winter months. *Hymenocallis (Ismene) calathina* is the species commonly grown in this way. *H. Amancaes*, the only yellow-flowered species, can be handled similarly, as also the yellow-flowered hybrid between the two, *Sulphur Queen*, still very rare in America.

H. speciosa and *H. macrostephana*, both very rare in the United States, are described as being the finest horticultural types. They have leaves like the *Eucharis*, while most other *Hymenocallis* have strap leaves like those of hybrid amaryllis.

The *Hymenocallis* species have been popularly mis-named for many years "spider lilies". This is unworthy of their true beauty, which is equal to that of the nerines in their way, and the American Amaryllis Society, in its effort to better the situation, has adopted the title "Amerindian Lilies" for the group. It is hoped that this more pleasant-sounding name will become generally accepted and adopted. The name "Amerindian" is suitable as the species are strictly American with the possible exception of one, *H. senegalensis*, from West Africa, which is regarded as doubtful.

There is a rich field for the student and horticulturist in the *Hymenocallis* group, as there exists much confusion and mistaken information regarding nomenclature. There are also believed to be a number of unidentified species yet to be reported in various areas.

In Florida, Dr. Hamilton P. Traub⁷ and the writer, besides Dr. H. Harold Hume, who has recently become interested in this genus, have devoted considerable attention in the past several years to the collecting of species of *Hymenocallis* from the wild, and to assemble a representative collection of the many types found growing in gardens.

Morton (page 80, 1935 Year Book) lists *Hymenocallis Collieri*, *floridana*, *keyensis*, *Kimballi*, *laciniata*, *Mexicana*, *Palmeri* and *tridentata*, as native to one part or another of Florida. Of these, the writer has collected only one species that has been definitely identified, *H. floridana* (Raf.) Morton, which Small lists as *H. rotatum*, Le Conte, in his Manual of the Southeastern Flora. Another dwarf species, believed to be *H. Palmeri*, has been collected and is under observation, but has not bloomed. Two more unidentified species have been collected. One of these, gathered in two places in Seminole county, has the most beautiful flower and cup of any *Hymenocallis* species yet noted in Florida.

What is probably *Hymenocallis keyensis*, (or *H. Caribeana* and *H. Caymanensis*) and a number of closely allied types are common in old Florida gardens and presumably over the lower South. They have large, shiny strap leaves like a large amaryllis and form decorative foliage plants as they are mostly evergreen unless cut down by frost. They grow well in rich, well-drained soil, or in sand, and produce their fragrant white, showy umbels of blooms in the early summer. The flowers are marked by the characteristic *Hymenocallis* cup (the name means beautiful mem-

⁷Dr. Traub has the following in his collection,—One species collected for him by Mr. Heaton in Monroe County on the Florida Keys; one species from the Everglades, Collier County; one species from the West Coast collected by Dr. Hughes in Lee County; one species collected on the banks of the St. Johns River in Brevard County; one species from Mitchell Hammock, and one species found northwest of Oviedo, both in Seminole County, and one species from Benson Springs in Volusia County.

brane) which extends between the filaments. The variation between various species and garden types is frequently in the size and shape of the cup.

The illustration of a *Hymenocallis* plant in bloom appearing in this number of "Herbertia" was grown from bulbs obtained in Mitchell Hammock, a rich muck hollow near Oviedo, Florida. The bulbs were gathered in 1935 and the bloom appeared at Lakemont Gardens, Winter Park, Fla., in early June, 1936. The bulbs grew naturally in a nearly pure vegetable humus, and were replanted in rich lake-shore soil.

This species seems to set seed readily. It has a small bulb, the pot in the photograph being of five-inch size. The bulbs are about $1\frac{1}{4}$ inches diameter at maturity. The flower pictured was identified from an herbarium specimen by the United States National Museum, Smithsonian Institution, Washington, D. C., as *Hymenocallis Floridana* (Raf.) Morton. There are two flowers, with a petal spread of eight inches each, and a snow-white cup more than $2\frac{1}{2}$ inches in diameter. The flower is a typical and striking example of the beauty of this group of amaryllids. The flowers opened on the night before the picture was taken, and remained in good condition for a few days. The foliage is like that of a small hybrid amaryllis. The perfume is strong and pleasant.

AMARYLLID ISSUE OF THE "MAYFLOWER MAGAZINE"

WYNDHAM HAYWARD, *Florida*

The interesting amaryllid number of the well known John Lewis Childs magazine of former years, the "Mayflower", dated August, 1904, has been brought to our attention by Mr. Cecil Houdyshel of LaVerne, Calif., who very courteously sent us the faded and delicate little pamphlet that he treasures.

For several years the writer had endeavored to obtain a copy of this issue of the "Mayflower", published at Floral Park, N. Y. by The Mayflower Publishing Company, of which the late John Lewis Childs was president. The Childs firm had an important part in the popularization and introduction of interesting amaryllids, as well as the famous Childs' hybrid amaryllis, more than 30 years ago, especially in the first decade of the 20th century. The issue devoted to amaryllids was very rare, however, and inquiries which were even brought to the attention of Mrs. Childs, widow of the flower specialist, gave no result, as she stated she did not know where a copy might be obtained.

The subject of "Amaryllids" in the magazine under discussion was treated by Walter Nathan Pike, concerning whom we have no additional information at this time. The article was divided into sections, five in number, and covering, about 20 pages of close type. There are a few drawings as illustrations. The main sections of the article are as follows: The Amaryllis Family; The Amaryllis and its Culture; The Crinum and its Culture; The Hippeastrum and its Culture; Other Amaryllids and their Culture. This last section covers *Brunsvigia*, *Clivia*, *Chlidanthus*, *Cooperia*, *Eucharis*, *Haemanthus*, *Hymenocallis*, *Ismene*, *Lycoris*, *Nerine*, *Phaedranassa*, *Sprekelia*, *Sternbergia*, *Vallota*, and *Zephyranthes*.

Among interesting items noted are the following:—"Many will doubtless be surprised to learn that the Belladonna Lily is perfectly hardy in Orange, N. J., without any winter covering or protection whatever"; "The only hybrid (*Crinum*) in general cultivation is *Crinum Powellii*, a cross between *C. longifolium* and *C. Moorei*."

"Unfortunately the majority of these magnificent hybrids (Amaryllis) increase so slowly that they cannot be sold at prices sufficiently low to place them within the reach of flower lovers in general."

"It (*Hippeastrum equestre*) is to be found in almost every Florida dooryard, great clumps consisting of sometimes as many as 50 bulbs, that produce a perfectly marvelous display when in full flower in March and April. Although it grows there like a weed, and absolutely without care, at the North it is not so accommodating. Success with it as a pot plant depends on a soil made light with sand and in winter keeping it warm, with the soil neither too moist nor too dry."

"As the *Brunsvigias* succeed in the gardens of the Riviera in Southern France and Northern Italy, it is reasonable to suppose they would also flourish in the gardens of our own South, to which they would make a grand acquisition."

"Strong sunshine is injurious to these plants (*Clivias*) at any season of the year, therefore select a more or less shady situation for them; and as they are evergreen and have no true bulb, they must never be dried off sufficiently to cause the leaves to die."

"They (*Cooperias*) are equally desirable for pot culture or for the open ground and may be wintered in the pots or like *Gladiolus*, etc."

COLLECTING ZEPHYRANTHES ATAMASCO AND TREATIAE IN NORTHEASTERN FLORIDA

MRS. W. E. MACARTHUR, *Florida*

For several years I have been studying and collecting bulbs and seeds of *Zephyranthes* found in this and other localities. The writings of Mr. H. H. Hume of Gainesville, Florida have been of inestimable value to me in this interesting study.

May, 1935 I gathered a fine lot of *Zephyranthes Treatiae* seed and many bulbs. Seeds were promptly sent to Natal, South Africa and a recent report tells of many sturdy *Treatiae* seedlings anxiously being watched for first bloom. Also, bulbs and seeds have been sent to New Jersey, North Carolina, Texas and Louisiana where they seem to be at home, and they have created a wholesome interest in themselves.

It would be reasonably safe to say that there is more acreage of *Zephyranthes Treatiae* in Duval County than any other County in Florida. I know of an inclosed pasture that is never burned-over, and every spring, with unfailing regularity, it is covered with myriads of these dainty Fairy Lilies, especially after a good rain. I have observed that in clearing these pine flatwoods for cultivation, the bulbs seem to disappear entirely just as does the common but valuable wire-grass (*Aristida stricta*).

It is almost impossible to locate *Zephyranthes Treatiae* after the blooming season is over, as the sparse foliage quickly disappears.

Recently I found Mrs. Mary Treat's "Home Studies in Nature" in a second-hand book shop, and it immediately became a prized possession. This book was written during the years of 1876 to 1886. In the Chapter "Life in Florida" she describes the delight of finding a wonderful large "Amaryllis atamasco" growing in the soft mucky soil along the banks of Governor's Creek near Green Cove Springs, Florida in January, 1876. Later she discovered a large area of similar beautiful lilies blooming in the low pine barren among the grass near the St. Johns River. Noticing particularly that the foliage was different from that of *Zephyranthes Atamasco* for the leaves were narrow, thick, shorter and of a different shade of green. Bulbs of these new lilies were sent to the Botanic Gardens at Harvard where they were pronounced a new species and named by Professor Sereno Watson, *Zephyranthes Treatiae*.

There are many fine colonies of *Zephyranthes atamasco* growing in secluded, almost impenetrable areas in this section. One fine colony of the loveliest whitest flowers flourished in the cool, shady, mucky shores of Fishweir Creek within the shadow of Jacksonville's skyline. Last December I paid them a visit expecting to see a few pearly spears only to find that drainage workers had deepened the Creek bed and the bulbs were buried in mud. Some of the bulbs had sent up a few leaves and upon digging for bulbs I discovered that they had formed another bulb up the neck as much as three inches above original bulb in an emergency effort to lift themselves out of excess mud. Many of these bulbs will decay before they can lift themselves to proper depths and it is unfortunate that many native colonies are destroyed in a similar manner.

I found some fine large white *Zephyranthes atamasco* growing in a cypress hammock in Nassau County near the highway under one of the largest Red Buckeye

(Continued on page 90)

CLASSIFICATION OF AMARYLLIS (HIPPEASTRUM) FLOWER TYPES

Revised for 1937 and 1938 shows: Hybrid amaryllis shall be placed tentatively into the (1) Grandiflora, and (2) Miniature groups on the basis of the characters indicated below,—

GRANDIFLORA GROUP

The Grandiflora group is tentatively divided into the following subgroups,—

- A. Flowers distinctly drooping, tube long (over 3 inches long)
 - B. Tube very long (over 4 inches) *Solandriflorum Type A*
 - BB. Tube shorter (3 to 4 inches) *Solandriflorum Type B*
- AA. Flowers slightly upright, horizontal or slightly drooping, tube short
 - C. Tube narrow, (1 to 3 inches)
 - D. flower compact, *Reginae Type A*
 - DD. flower pointed, *Reginae Type B*
 - CC. Tube open (to 1 inch)
 - E. flower compact, *Leopoldi Type A*
 - EE. flower pointed, *Leopoldi Type B*

NOTE,—For exhibition purposes there shall be two major classes, (1) Exhibition classes in which flower form and size standards are the important considerations, and (2) Decorative classes in which the use of the plant—landscape, rock garden, forcing, etc., shall be the important considerations.

MINIATURE GROUP

The Miniature group is tentatively divided into the following subgroups,—

- A. Tube narrowly funnel-shaped, *Phychella Type*
- AA. Tube openly funnel-shaped, *Habranthus Type*

CLASSES AND AWARDS (PRIZE SCHEDULE)

At the annual National Amaryllis Show, and at other exhibitions, as voted by the Board of Directors, the Society will award its First Class Certificate for meritorious new and standard varieties; its award of merit; and its first, second, third and fourth prize ribbons, in the classes indicated below. Any money prizes offered shall be authorized by action of the Board of Directors.

Each species or varietal exhibit shall consist of one or more potted flowering plants, or one or more flower scapes up to and including 1938; after which date three potted flowering plants or three flower scapes shall be required in each case.

SECTION A. AMARYLLIS (GENUS HIPPEASTRUM)

- Class 1. Single entries of Hippeastrum species.
- Class 2. Best collection of botanical species and varieties.
- Class 3. Best collection of 10 or more Grandiflora varieties.
- Class 4. Best collection of 5 to 10 Grandiflora varieties.
- Class 5. Best collection of 10 Decorative varieties.
- Class 6. Best collection of 5 or more Miniature varieties.
- Class 7. Best display.
- Class 10. Best bloom in Show.

Standard Grandiflora and Miniature Varieties

The score card, and prize schedule are reproduced on the following pages.

Score Card—Exhibition Type⁸ Hybrid Amaryllis (*Hippeastrum*)

All flowers to be expanded in ½ or more direct sunlight.

Color Class No..... Exhibitor's No.....

Flower Type.....

CHARACTER TO BE SCORED	METHOD OF RATING	POSSIBLE SCORE
Color and texture	No flower of inferior color to be considered; the full 50 points to be deducted for major color defects; dark green in combination with medium and dark red is especially objectionable.	50
Form	Rating should be based on conformity to type.	15
Size	Except in the case of Solandriflorum types, the following shall rule (diameter across face): 6" to 7", allow 5 points; 7" to 9", allow 10 points; 9" and above, allow 15 points.	15
Habit	For Solandriflorum types the drooping habit is normal; but for Reginae and Leopoldi types, horizontal and slightly erect carriage are to be favored, although slight drooping is allowable.	5
Number of flowers to scape	For less than 3 or more than 5 allow 2 points; for 3 to 5 allow 5 points.	5
Length of scape	The length should be considered in relation to size of flower; scapes too short or too long should be penalized	5
Character of scape	Scapes should not be so coarse as to be conspicuous, but should be sturdy enough to hold up flower well	3
Fragrance	Should not be too faint or too strong	2

⁸NOTE: No entry is to receive first prize unless a rating of a least 86 points is merited; second and third prizes may be awarded to entries rating from 76 points up. A Score Card for the Decorative Type is in preparation.

Classes of Grandiflora and Miniature Varieties (Prize Schedule)

Standard Grandiflora Varieties										Standard Miniature Varieties								
										Decorative Types								
										Solandra-Florum Type A	Solandra-Florum Type B	Reginae Type A	Reginae Type B	Leopoldi Type A	Leopoldi Type B	Habran-Thus Type	Phychella Type	
Color Classification (Fischer Color Chart)										Solandra-Florum Type A	Solandra-Florum Type B	Reginae Type A	Reginae Type B	Leopoldi Type A	Leopoldi Type B	Habran-Thus Type	Phychella Type	
White without markings.....										101	151	201	251	301	351	401	451	501
White with slight pale red markings										102	152	202	252	302	352	402	452	502
White with lighter red markings....										103	153	203	253	303	353	403	453	503
White with lighter red stripes, keels, stars, tips, etc.....										104	154	204	254	304	354	404	454	504
White with red stripe, keels, stars, tips, etc.....										105	155	205	255	305	355	405	455	505
Yellow without markings.....										106	156	206	256	306	356	406	456	506
Yellow with markings.....										107	157	207	257	307	357	407	457	507
Bronze without markings.....										108	158	208	258	308	358	408	458	508
Bronze with slight markings.....										109	159	209	259	309	359	409	459	509
Bronze with distinct markings.....										110	160	210	260	310	360	410	460	510
Orange without markings										111	161	211	261	311	361	411	461	511
Orange with slight markings.....										112	162	212	262	312	362	412	462	512
Orange with distinct markings.....										113	163	213	263	313	363	413	463	513
Pale red without markings.....										114	164	214	264	314	364	414	464	514
Pale red with slight markings.....										115	165	215	265	315	365	415	465	515
Pale red with distinct markings.....										116	166	216	266	316	366	416	466	516
Lighter red to light red without markings										117	167	217	267	317	367	417	467	517
Lighter red to light red with slight markings										118	168	218	268	318	368	418	468	518
Lighter red to light red with distinct markings										119	169	219	269	319	369	419	469	519
Red without markings.....										120	170	220	270	320	370	420	470	520
Red with slight markings.....										121	171	221	271	321	371	421	471	521
Red with distinct markings.....										122	172	222	272	322	372	422	472	522
Dark red.....										123	173	223	273	323	373	423	473	523
Darker red.....										124	174	224	274	324	374	424	474	524
Violet red.....										125	175	225	275	325	375	425	475	525
Rainbow and tri-color types, excluding green.....										126	176	226	276	326	376	426	476	526
Any other color.....										127	177	227	277	327	377	427	477	527
Best bloom of type.....										149	199	249	299	349	399	449	499	549

SECTION B. HEMEROCALLIDS (DAYLILIES)

- Class 601 Best collection of Hemerocallis species.
- Class 602 Best collection of hybrid Hemerocallis varieties.
- Class 603 Best Display of hybrid Hemerocallis varieties.
- Class 610 Best hybrid Hemerocallis bloom in show.
- Class 621 Single entries of hybrid Hemerocallis varieties.

Class 651 Hosta

Class 661 Leucocrinum

Class 671 Hesperocallis

SECTION C. AMARYLLIDS (EXCEPT GENUS HIPPEASTRUM;
SEE SECTION A, ABOVE)

- Class 701 Best collection of Agapantheae
- Class 702 Agapanthus

Class 703 Tulbaghia

- Class 751 Best collection of Allieae
- Class 752 Bloomeria
- Class 753 Muilla
- Class 754 Allium
- Class 755 Nothoscordum
- Class 756 Tristagma
- Class 757 Steinmannia
- Class 758 Brodiaea

- Class 759 Diphalangium
- Class 760 Milla
- Class 761 Androstephium
- Class 762 Behria
- Class 763 Bessera
- Class 764 Leucocoryne
- Class 765 Stropholirion
- Class 766 Brevoortia

- Class 801 Best collection of Gilliesieae
- Class 802 Erinna
- Class 803 Solaria
- Class 804 Speea
- Class 805 Trichlora

- Class 806 Miersia
- Class 807 Gilliesia
- Class 808 Gethyum
- Class 809 Ancrumia

- Class 851 Best collection of Galantheae
- Class 852 Galanthus

- Class 853 Lapiedra
- Class 854 Leucoium

- Class 901 Best collection of Amaryllidaceae
- Class 902 Amaryllis (Belladonna)
- Class 903 Brunsvigia

- Class 904 Ungernia
- Class 905 Nerine

- Class 951 Best collection of Crineae
- Class 952 Chlidanthus
- Class 953 Crinum
- Class 954 Ammocharis

- Class 955 Cyrtanthus
- Class 956 Stenolirion
- Class 957 Vallota

- Class 1001 Best collection of Zephyrantheae
- Class 1002 Zephyranthes
- Class 1003 Cooperia
- Class 1004 Haylockia

- Class 1005 Crocopsis
- Class 1006 Apodolirion
- Class 1007 Sternbergia
- Class 1008 Gethyllis

Class 1051 Best collection of Haemantheae

Class 1052 Hessea

Class 1053 Carpolyza

Class 1054 Strumaria

Class 1055 Buphane

Class 1056 Griffinia

Class 1057 Clivia

Class 1058 Haemanthus

Class 1059 Choananthus

Class 1101 Best collection of Ixiolirion species

Class 1151 Best collection of Eucharideae

Class 1152 Hyline

Class 1153 Stenomesson

Class 1154 Pamianthe

Class 1155 Pancratium

Class 1156 Elisena

Class 1157 Ismene

Class 1158 Hymenocallis

Class 1159 Calostemma

Class 1160 Calliphruria

Class 1161 Eucharis

Class 1162 Stricklandia

Class 1163 Eurycles

Class 1164 Klingia

Class 1201 Best collection of Eustephieae

Class 1202 Urceolina

Class 1203 Hieronymiella

Class 1204 Eustephia

Class 1205 Eustephiopsis

Class 1206 Callipsyche

Class 1207 Eucrosia

Class 1208 Phaedranassa

Class 1251 Best collection of Hippeastreae (Except Genus Hippeastrum)

Class 1252 Placea

Class 1253 Sprekelia

Class 1254 Lycoris

Class 1255 Vagaria

Class 1401 Best collection of Narcisseae

Class 1402 Cryptostephanus

Class 1403 Tapeinanthus

Class 1404 Best collection of Narcissus species

Class 1405 Trumpet Narcissi

Class 1406 Incomparabilis Narcissi

Class 1407 Barrii (also Burbridgi) Narcissi

Class 1408 Leedsii Narcissi

Class 1409 Triandrus Narcissi

Class 1410 Cyclamineus Narcissi

Class 1411 Jonquilla Narcissi

Class 1412 Tazetta and Tazetta Hybrid Narcissi

Class 1413 Poeticus Narcissi

Class 1414 Double Narcissi

SECTION D. ALSTROMERIALES

Class 1501 Alstroemeriaceae

Class 1551 Petermanniaceae

Class 1601 Philesiaceae

(Continued from page 85)

trees (*Aesculus Pavia*) that I have ever seen in this section. They were not in colonies and they grew deep and were difficult to extract from muck.

There seems to be a general impression that burned-over woods brings the *Zephyranthes Treatiae* into bloom. I doubt this belief, but the blackened woods do make a wonderful setting for these lovely dainty lilies that suddenly gladden the landscape in May. It is certain that moisture plays an important factor in bringing the Rain Lilies into perfection as it does with other blooming plants.



Wyndham Hayward

Pure White Hybrid Hippeastrum, Edelweiss

REGISTRATION OF NEW VARIETIES

Descriptions of new varieties of *hybrid amaryllids*, *hemerocallids*, and *alstroemerids* for this section must reach the Secretary not later than May 1 to be included in the current Year Book (Herbertia). This information is published to avoid duplication in names, and to provide a place for the authentic recording of descriptions. Names should be as short as possible, one word is sufficient. It is suggested that in no case should more than two words be used.

HYBRID AMARYLLIDS

Introduced by Mr. Frank Vasku, Winter Park, Fla. Hybrid Hippeastrums, No. 54, *Rouge*, leopoldi type B, deep red, FCC-36⁹; No. 87, *Bertha Vasku*, reginae type B, deep red, FCC-36.

Introduced by Dr. Hamilton P. Traub, Mira Flores, Orlando, Fla. Hybrid Hippeastrum, No. 69, *Marina*, leopoldi type B, white with light pink markings, 10½" diameter.

Introduced by Mr. I. W. Heaton, Orlando, Fla. Hybrid Hippeastrums, No. S1126, *Orlando Salmon*, leopoldi type A, light salmon, slightly darker at throat, uniform rounded petals; received the award for the best bloom at the 1936 National Show; No. 1524S, *Red Sunset*, leopoldi type A, a blood red compact bloom, very uniform rounded petals, open face slightly veined with darker keel; award of merit for best bloom of compact leopoldi type at 1936 National Show.

Introduced by Mr. Wyndham Hayward, Lakemont Gardens, Winter Park, Florida. Hybrid Hippeastrum, No. 167, *Edelweiss*, intermediate between Leopoldi types A. and B., pure white, of good size, 7 in. in diameter, broad petals and excellent shape.

R. H. S. HYBRID AMARYLLIS AWARDS

Two varieties of hybrid Amaryllis (Hippeastrum) were given the official Award of Merit of the Royal Horticultural Society in England during April, 1936, according to published data in the June issue, Journal of the R. H. S. as follows:

"Hippeastrum *Carolyn* A. M. April 7, 1936. From Mrs. Walter Burns, North Mymms Park, Hatfield; a very handsome rich blood-red variety with large flowers; the segments of the perianth are very firm and of good substance.

"Hippeastrum *Clive Cookson* A. M. April 21, 1936. From Clive Cookson, Esq. (gr. Mr. W. J. Stables), Hexham; a very handsome variety with large glowing vermilion flowers deepening to blood-red at the center; the segments are broad and reflexed; the open flowers are of perfect form and measure slightly over 7 inches across at the widest part."

NEW DAYLILIES

Dr. A. B. Stout, Director of the Laboratories, New York Botanical Garden, has favored us with the following descriptions, including illustrations, of two new outstanding hybrid Daylilies which are to be introduced in the near future.—ED.

THE LINDA DAYLILY

In respect to the ensemble of coloring, the flowers of the Linda Daylily are somewhat bicolored, pale-fulvous, and eyed. The throat is a shade of yellow approaching apricot yellow with greenish tinges at its base; the sepals are more clearly yellowish with almost no traces of fulvous; the outer half of the petals is delicately overcast with pale fulvous and there is a conspicuous eye zone of Brazil red bisected by a strip of pale fulvous that extends along the midvein toward the throat. The open flowers have a spread of about 4½ or 5 inches, and they are spreading rather than recurving. A well-known plant usually stands between 3 and 4 feet tall and the scapes are much branched and upstanding. The season of bloom at New York is in early July.

fulva The ancestry of the Linda Daylily includes the species *Hemerocallis Thunbergii*, *H. citrina*, and two different seedlings of *H. flava* which came from the wild in central China.

The above is the first printed description and mention of this daylily.

—A. B. STOUT.

⁹FCC is the abbreviation for First Class Certificate from the American Amaryllis Society, the figures following refer to the year of the award.



New York Botanical Garden

Flower of Linda Daylily

Natural size



New York Botanical Garden

Flower of Wolof Daylily
Natural size

THE WOLOF DAYLILY

The Wolof Daylily has flowers of dark brownish-red-fulvous coloring, the stature of the plant is robust (from 3 to 4 feet), and the season of bloom at New York is in July. A more precise designation of the flower coloring according to Ridgway's "Color Standards and Nomenclature" is as follows:—The throat is clear



New York Botanical Garden

The Wolof Daylily

orange near the shade of light cadmium; the sepals are between Morocco red and garnet brown without either a mid-zone or a central stripe; the petals have a mid-zone near garnet brown or maroon, which is somewhat darker than the sepals; the blade outside this zone is near Morocco red with darker veins; the stripe that extends through each petal tapers and is not sharply defined along its margins. The back of

(Continued on page 113)



Massachusetts Horticultural Society

Hippeastrum reticulatum striatifolium

4. GENETICS AND BREEDING

INHERITANCE IN HIPPEASTRUM RETICULATUM-STYLOSUM CROSSES

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Hippeastrum reticulatum was introduced into India prior to 1879 as I find mention of the variety in a price list of our Society for that year though a list of 1874 fails to give the name. When the variety *Mrs. Garfield* was introduced I have been unable to trace as our sources of reference in this respect are meagre. I have however read in some catalogue of English Nurserymen of 1880-86 that there were a number of *reticulatum* hybrids raised but only *Mrs. Garfield* survived. In William Bull's catalogue of 1882-3 I see that *reticulatum* is offered at 5 shillings and a variety *Pirloti* at 10/6 and 15 shillings. I wonder whether the *Hippeastrum Mrs. Garfield* obtained from a friend in Sussex, England last year is the variety *Pirloti* for it is quite distinct from our *Mrs. Garfield*. In this connection I think it right to call attention to Bailey's Cyclopædia where on page 1493 he gives the colour of *reticulatum* as bright mauve or purple red whereas it is a distinct pink. However it is not about *reticulatum* I wish to write this note but in connection with the progeny raised from *H. reticulatum* pollinated by *H. stylosum* and vice versa.

H. reticulatum and *Mrs. Garfield* both flower during our wet weather, i.e., July-September but *stylosum* and other varieties in March-April. In 1932 an out of season spike of *stylosum* appeared in July and all four flowers were pollinated by *reticulatum* and the twin flowers of *reticulatum* were fertilised by *stylosum* pollen. The *reticulatum* pods gave only three round Canna-like seeds but from the three *stylosum* pods that ripened I obtained 61 plump seeds and a large number of papery ones. In due time all 64 seedlings showed above ground and surprised me by displaying a thin white midrib. Today I have the sixty four bulbs but many have not made much growth, most bulbs being the size of a hazel nut or smaller but five or six are an inch and a half in diameter. The variation in length of leaf runs from 10 to 13 inches with an average width of an inch and a half, the midrib is represented as a thin line or striping to a width of an eighth inch. The *reticulatum* trio have darker foliage and the stripe is whiter than the others and the base on the reverse flushed wine red as in *reticulatum*.

Two bulbs flowered last August, both pink though there was a difference in shade between pure *reticulatum* and the hybrids but the netting was present, one was twin flowered and the second bore four blooms which were more or less like *stylosum* in shape. I am looking forward to the remaining bulbs flowering and hope there will be sufficient variation from normal to warrant the experiment.

Note the measurements of foliage of the following:—

stylosum, length 15"-18", width 1½"
reticulatum, 12", width 2½", stripe ¼"
Mrs. Garfield, 15"-16", width 2", stripe ⅜"
Pirloti (?), 14", width 3½", stripe ½" to ¾"
hybrids, 10"-13", width 1½" stripe from a thin line 1/32" to several stripes.

THE CULTIVATED VARIETIES OF POLYANTHUS AND RELATED NARCISSI

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The number of cultivated varieties of *N. Tazetta* has decreased considerably since Baker wrote in his monograph "The Narcissus" in 1875—"These natural varieties have been largely augmented by the Dutch florists who raise numerous seedling forms So long ago as 1800 between two and three hundred garden forms were cultivated." It is remarkable therefore, that the modern hybridist who has added so many wonderful flowers to the other classes, should have neglected the Polyanthus Group entirely and that there are no new varieties available. Let us hope that the late Dr. David Griffith's appeal in the Amaryllis Society's Year Book for 1935, may be successful in arousing an interest so that we may look forward to new treasures in the future.

N. Tazetta—(Polyanthus Narcissus)

- var. papyraceus grandiflorus*—*Paper White*.
- "Chinese Sacred Lily"—single & double forms.
- Grand Soleil d'Or*.
- Grand Primo*, and *Scilly White*.
- Grand Monarque*.
- var. compressa*.
- var. gloriosus*.
- Avalanche*.

Most of these varieties are well known to all daffodil enthusiasts. Of the lesser known *Scilly White* is an attractive free growing variety rather like *Grand Primo*. Its origin is lost in antiquity, but it has certainly been growing in Scilly for 200 years. The plant is of very easy culture indoors and out, and is less stiff than *Grand Primo* with a whiter flower and paler citron cup. The distinctions are slight, and being softer it is not too good as a market flower. *Tazetta compressa* is an old variety, useful for the garden. The flower is a rather discoloured white with a bright lemon cup. The scape is many flowered with each flower in the truss looking straight at you. *Gloriosus* is a strongly scented white and bright orange flower. Its form and substance are not good but the plant is quite distinct, and like most polyanthus varieties it forces well. It will grow under cooler conditions than are tolerated by most true *Tazetta* varieties. *Avalanche* is a very robust garden variety with similar colouring to *Grand Monarque*. The leaves are broad, so that an amateur gardener's enquiry why so many leeks were being grown may be excused. *Her Majesty* is sometimes listed, but the perianth is not so white as that of *Gloriosus* which is to be preferred.

N. xpoeta—(*N. Tazetta* x *N. poeticus*.)

- Laurens Koster*
- Helios*
- Early Perfection*
- Admiration*. A. M. 1914. (R. H. S.)
- Scarlet Gem*. A. M. 1914.
- Cragford*
- Medusa*. F. C. C. 1926. (R. H. S.)
- Glorious*. F. C. C. 1926. A. M. 1928.
- St. Agnes*. A. M. 1926. F. C. C. (Haarlem) 1927.
- King Craft*. A. M. 1925.
- Red Guard*. A. M. 1923. F. C. C. (Haarlem) 1927.
- Cheerfulness*. A. M. 1923.

The first four are of Dutch origin and are pre-eminently forcers. Of these *Laurens Koster* is the most widely grown. It is very easily managed and is as useful for the amateur's pots, as it is to the market grower.

Early Perfection is a white and yellow forcing variety of poor form and only grown for this purpose. *Helios* (poetaz) is primrose yellow with a deeper yellow frilled cup; inclined to be rather thick and short in stem. *Admiration* has a finer flower than *Orange Cup*, and is a larger plant. The petals are sulphur yellow with an orange-scarlet edge to the cup. All the above may be readily obtained at low prices.

Scarlet Gem is a decided acquisition, and has conspicuous *Tazetta* characteristics. It is an excellent pot plant and will be more widely grown as it becomes cheaper. It is one of the late P. D. Williams productions, the flowers are yellow with a bright orange-red cup. *Cragford* is white with orange-red cup and was considered by the raiser, P. D. Williams, to possess outstanding forcing qualities. The perianth is not too good and the stock is still small, but it is the earliest red and white variety we have at present. *Medusa* was one of the first of the white poetaz with an almost blood-red eye. Highly decorative but with an objectionably long pedicel, the variety is soft but has the merit of being cheap to buy and should be grown by all. *Glorious* is an outstanding variety with two to four blooms on a stem, and almost as large as a "Poet" with pure white perianth and an orange-scarlet eye. It was raised by J. C. Williams and is generally considered the best poetaz extant. The flowers are carried well above the leaves which have a rather drooping habit. *St. Agnes* is one of the many superb poetaz varieties which P. D. Williams has given us. It is similar in colouring to *Glorious*, but of more erect growth. *King Craft* is the largest poetaz variety so far exhibited. It is a most robust plant of rapid increase with ivory-white overlapping perianth, and a bright orange-red eye. *Red Guard* is a remarkable flower raised by the late Mrs. R. O. Backhouse—deepest golden yellow with a small deep red cup. The colour from the crown radiates into the petals. It may be bought for two or three shillings a bulb. *Xenophon* A. M. 1922 is another of Mrs. Backhouse's raising that should be mentioned. It shows fine yellow and red colour contrasts. *Halvose* is also a flower that pleases many. Raised by P. D. Williams, this is a yellow and orange-red poetaz with a scarlet sheen in the petals. *Cheerfulness* is a most desirable and distinct plant, bearing three or four large neat double blooms on a stem. It is a double form of *Elvira* with creamy-white petals, and white and yellow centre. The variety is being grown for the flower market in increasing quantities each year.

N. triandrus x *N. Tazetta*

Silver Chimes is a most fascinating hybrid, and a very satisfactory pot plant. Guy Wilson states that he has grown it in a cold green-house for three years in succession in the same large pots which were then transferred to the show bench. Out of doors even in the south-west of England it is inclined to come rather too short.

There are other desirable varieties such as *N. Tazetta* var. *canaliculatus*. This is a dainty sub-species from Mentone with many flowers on a stem, and is suitable for a sunny situation in the rock garden. Lack of space precludes mention of other varieties for the present.

THE HORTICULTURAL CLONES OF DAYLILIES AND THEIR EVALUATION

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A survey of the known species of daylilies (*Hemerocallis*) was presented in the Year Book of the American Amaryllis Society for 1935, and hence this article will attempt to survey and to some extent evaluate the horticultural clones in this group of plants.

The development of the daylilies as garden plants, quite as in other groups of horticultural plants, involves the discovery of wild types which are brought into cultivation; the selection of chance variations or hybrid seedlings which may appear and attract attention; and the deliberate effort to obtain new types by hybridization and selective breeding. It is to be noted that the daylilies, both of the species and of the derived sorts, are propagated vegetatively by division and that the production of new daylilies consists in obtaining seedlings of merit which are then multiplied by division to give horticultural clones.

The wild types of daylilies already described include but thirteen distinct species several of which have only recently been known. In addition certain wild types have recently come from the Orient which may later be designated as species. Although the species are not numerous they do provide excellent material for hybridization and selective breeding for they display a wide diversity in stature, habit of growth, season of flowering, and in the color, size, and form of the flowers. In stature there is a range from about a foot in height to seven feet tall. The flowering season in the vicinity of New York extends from early May until heavy freezes in October. The colors of the flowers include yellow and orange in clear colors and orange in combinations with fulvous red. It is certain that other wild types remain in the Orient to be discovered, introduced into culture and used in hybridizations in the future improvement of the group.

Almost no horticultural development of the daylilies has occurred in the Orient. One interesting type with double flowers, of which there are two rather distinct clones, has been long and widely cultivated in the Orient. Certain daylilies have been cultivated in China for the flowers which are used as a food that is deservedly regarded as a delicacy. But only a few of the hybrid daylilies now grown as garden clones originated in the Orient.

In Europe the production of horticultural daylilies began about 1890. At that date several types (*Hemerocallis flava*, *H. minor*, *H. Middendorffii*, *H. Dumortierii*, and *H. fulva* clone Europa) were being grown. The first four of these flowered about the same time early in spring and a few accidental hybrids between these types as parents appeared. It occurred to Mr. George Yeld, who is still living in England, that these types of daylilies might be good subjects for hybridization and breeding. The first of his hybrids to be made is *Apricot* which was first exhibited in 1892. Some of these early hybrids as *Estmere*, *Apricot*, *Tangerine*, *Gold Dust* and *Sovereign* (the last two are of unrecorded origin) are excellent garden subjects that will probably never be surpassed for their own respective classes. These clones are semi-dwarf; they bloom in May and early June; the flower colors are yellow or orange; and they exhibit considerable diversity in habit of growth.

In the decade between 1890 and 1900 three new species and two clonal types of daylilies either came from the Orient or were definitely described for the first time. These include the yellow-flowered *Hemerocallis Thunbergii*, the orange-fulvous *H. aurantiaca*, the night blooming *H. citrina*, the *H. fulva* clone *Maculata*, and the clone which was named "*H. aurantiaca major*." All of these flower in early July. Evidently one of the first of the hybrids from this group, and presumably the first hybrid *Hemerocallis* produced in America, was the *Florham* Daylily reported in 1899 as a seedling obtained by crossing *H. aurantiaca Major* by *H. Thunbergii*. In England the *Luteola* Daylily was mentioned in 1900. Willy Müller, in Naples, Italy, used *H. citrina* and certain fulvous types in breeding and several of his hybrids were mentioned as early as 1903. His *Parthenope* (1903) and *Sir Michael Foster* (1904), from *H. aurantiaca Major* and *H. citrina*, bloom in late June and early July and were distinct additions to the group of garden daylilies.

Other seedlings continued to appear, especially in the early-summer-blooming group, either as chance hybrids or as products of breeding endeavor until in 1925 about 100 such individuals had been named as horticultural clones. In the decade since 1925 (1925-1936) much attention has been paid to the growing of seedlings and in some cases there has been deliberate and extensive breeding. As a result about 150 more clones were added to the list of horticultural daylilies. On Jan. 1, 1936, the writer had record of 229 daylilies that had been named as horticultural clones and about 50 of these had appeared since 1934. In addition eight clones were announced as new for culture between Jan. 1, 1936 and May 2. With very few exceptions the clones introduced during the past decade have been produced in England and in

the United States and mostly the "breeding" has been done by the nurserymen, Mr. Thomas Perry, Mr. C. Betscher and Mrs. Thomas Nesmith, and by persons concerned only in the breeding as Mr. George Yeld and the writer. Various other persons have contributed one or more varieties each.

How shall we evaluate the clones of daylilies that have now been named for garden culture? Many are of no special merit and need not be considered for culture and this statement applies to a number of the clones named during the past two years. In the development of any group of garden plants certain seedlings are likely to be named and introduced by persons who know too few types and who have few seedlings from which to make selections. This has been and still is the case for daylilies. Some of the daylilies which would otherwise be rated high are very similar to each other. Also various daylilies which were "good" a few years ago are now excelled by more recent introductions. Thus the time has arrived when gardeners and nurserymen may well exercise critical evaluation of the various daylilies. The writer will not attempt to designate here what he considers to be the thirty best clones of those now named. The selection of such a group by any one will depend much on personal tastes and preferences. Also the value of such an evaluation will depend on the acquaintance which one has with the varieties in existence. Frequently one sees in print the statement that a certain daylily is the "best" one in existence and also lists of the "best daylilies" appear from time to time. In several instances of this sort it was determined that the rating was based on knowledge of only a few varieties which include almost none of the more recent and excellent clones. But in making these evaluations it is to be recognized that the group has become so diverse that there are rather distinct classes of daylilies and that one may select, of these now named for the trade, at least as many as thirty clones which are excellent and decidedly different.

The writer has already (in the volume DAYLILIES) indicated the main horticultural classes of daylilies in respect to such important features as (1) habits of flowering, (2) the color of flowers, (3) the stature and habits of growth and (4) season of flowering but a brief summary may be here given.

The dwarf class in which plants are not more than one foot tall. Of this stature there is a clone of *Hemerocallis Dumortierii* and also certain plants of the *H. minor*. Most of the so-called "gracilis" and "graminea" in the trade are semi-dwarf and the flowers are poor. The *H. nana* is evidently a dwarf scarcely a foot tall which grows wild in southwestern China but thus far this species seems not to thrive in culture. Surely its culture should be possible in some part of the United States. Special effort is being made to obtain dwarf plants in seedlings that are hardy. *H. nana* has been hybridized with a dwarf clone of *H. Dumortierii* and selections have been made for low stature in the *H. minor*. Some of the seedlings already obtained promise to be of value in cultivation.

Several clones described as "dwarf" are decidedly not of such a class. The clone "*Dwarf Yellow*" grows to a height of 32 inches. Certain of the author's hybrids which measured dwarf for several years slowly grew to a taller stature. But dwarf clones with attractive flowers of diverse colors are certain for the near future.

The semi-dwarf class may be designated as having a stature for one to two feet tall. Plants of this size exist in the *H. minor*, the *H. Middendorffii*, and the *H. Dumortierii*. Of the older clones *Gold Dust*, *Tangerine*, *Sovereign* and *Apricot* are often not more than two feet tall, but in rich soil well-established plants will exceed this height. The Summer Multiflora Hybrids stand about two feet tall. *Perry's Pigmy*, *Sir William* and *Sunkist* are described as not over two feet tall.

Of the *semi-robust class*, from two to three feet tall, there are various daylilies that are excellent and of a wide range in flower coloring, season of flowering and habits of growth.

A *robust class* may be considered as comprising clones from three to five feet tall. There will be found such species as *H. Thunbergii*, *H. aurantiaca* and various clones of the widely variable species *H. fulva*. A large number of horticultural clones are robust in stature.

A *giant class* with scapes rising more than five feet include several wild types thus far unnamed, certain plants of *H. exaltata*, and certain seedlings now under observation.

In respect to flower colors the main classes of the wild species are *yellow*, *orange*, and *fulvous*. But in the numerous hybrid clones the range of colors has been extended into almost every possible shade of yellow and orange in clear colors and in combinations with shades of fulvous and red. The greater number of the clones already named, and especially of the older ones in the trade, have flowers in yellow or orange shades of color, and although there is considerable duplication yet there is chance for the selection of a considerable number of excellent clones that differ in certain characters.

Of the older recognized species of *Hemerocallis* only two, *H. fulva* and *H. aurantiaca*, have the fulvous red coloring in the face of the open flower. Seedlings with fulvous colorings began to appear as early as 1899 under the names *Pioneer*, *Fulcitrina*, etc., but no progress was made in obtaining outstanding plants with fulvous colors until recent years. Many of the fulvous colored daylilies that are now being offered in the trade are dull in color and of little merit. In several of the excellent varieties the fulvous coloring is faint and not a conspicuous feature, as in *Ajax*, *Wau-Bun*, *Aureole* and *Vesta*. *Sirius* has rich orange flowers with a faint fulvous overcast. The *George Yeld* Daylily has large flowers with a moderate flush of fulvous. The *Margaret Perry* Daylily has a throat of yellowish orange that extends in a narrow medium stripe through the fulvous colored petals and sepals. Several other fulvous colored daylilies have been distributed by Mr. Amos Perry of which *Dawn*, *Shekinah*, *Sunkist*, *Imperator*, *Viscountess Byng*, and *Byng of Vimy* may be mentioned.

The writer has reared many thousand seedlings of the fulvous group. As a rule outstanding patterns of color have only been obtained after several generations of selective breeding. Of the seedlings named in this class mention may be made of the following: *Bijou* has small flowers of a sprightly shade of fulvous red. *Cinnabar* has a somewhat richer coloring than the *H. aurantiaca*. *Rajah* has a conspicuous zone of garnet brown with blades of English red and a throat of orange. *Bagdad* has shades of orange, fulvous red and madder brown. *Mikado* has flowers in which there is a large mahogany red spot in each petal and these provide a pattern of bold contrasts and *Jubilee* also has conspicuous eye blotches but the ground color of the rest of the flower is paler. *Vulcan* has dark rich maroon shades of color. *Nada* is semi-dwarf and the flower color is morocco red. The *Theron* Daylily is a distinctly new type of daylily; the throat is pale yellow orange but outside of this the entire flower is a dark shade that approaches mahogany red with the eye zone of slightly darker coloring. A rather distinct class of color includes many shades of rosy pink of which *Charmaine* is a selection.

The extension of the flowering period of daylilies throughout August, September and even later at New York has been possible by the use of a new species, *Hemerocallis multiflora*, in hybridization. Also this species has numerous flowers of small size which is a somewhat new quality for daylilies.

An extensive program in breeding of daylilies has been in progress at The New York Botanical Garden for about twenty years. The known species were all obtained and also wild plants were received from the Orient among which several new species and new types of older species were found. These have been hybridized in almost every possible combination. Selective breeding especially for certain types of flower colors has been continued for as many as seven generations. More than 50,000 seedlings have been grown from which about 500 have been selected as plants of special merit. These are being critically studied and only the ones that are judged most excellent and distinctive are being named for horticultural uses. The selections now being propagated for further tests and comparisons include especially (1) early flowering plants in a wide range of red colorings, size of flower, and statures, (2) dwarf plants, and (3) numerous excellent plants flowering throughout August and September.

The most complete collection of species, horticultural clones, and seedlings in existence has been assembled at The New York Botanical Garden. Here are representatives of the known species, various wild types thus far unnamed, typical F_1 hybrids of many combinations between species, and all the horticultural clones that it has been possible readily to obtain. Special effort is made to obtain the new clones as soon as they are offered to the trade either in Europe or in America.

There are also several thousand seedlings of recent breeding which include many distinctly new types of horticultural interest and which indicate what the daylilies of the immediate future will be like. There are always numerous plants in flower at any time from early May until late in autumn. Gardeners and nurserymen may visit this public display collection to observe and to compare the various daylilies and to make their own decisions regarding the relative merits of the selections that seem most desirable for culture.

Recently popular interest in daylilies has greatly increased. Nurserymen in various sections are attempting to obtain the newer daylilies and to develop stock of them. Named seedlings are appearing in increasing frequency from an increasing number of sources. Possibly there will soon be need for establishing trial gardens for testing the new clones of daylilies and for rating them according to class. There is also a distinct need for their evaluation in different parts of the United States whence climatic conditions are decidedly different.

The Garden Club of America has recently adopted a plan for a very comprehensive five-year study of the daylilies. Collections of the horticultural clones will be assembled in various gardens in different sections of the United States for critical comparison and evaluation. The results of such studies and tests will no doubt be of value in acquainting the general gardening public with the merits of the daylilies.

The list of named daylilies is already a long one and it seems certain that many more clones will appear in the future. No one gardener can grow or will want all the clonal varieties that are or will be listed by nurserymen. The descriptions in catalogs and elsewhere are not always adequate and fully satisfactory to the buyer. For example, one clone recently described as attractive proves to be merely a plant typical of the old well-known *Hemerocallis Middendorffii*. But in time the better clones will become widely grown and hence known to a large number of discriminating gardeners and it is their evaluations that will finally determine what varieties are most excellent.

STORAGE OF POLLEN OF HYBRID AMARYLLIS

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Interest was directed to the subject of longevity of pollen of hybrid *Amaryllis* in July, 1935, when samples of pollen in gelatin capsules stored in a dark glass bottle with tight screw cap, with anhydrous calcium chloride as the drying agent, were sent me by Mr. Wyndham Hayward. Of thirteen lots, stored in February and March, 1935, one showed a low percentage of pollen grains able to produce good tubes, another a few feeble tubes, while the rest did not germinate.

Pfundt (2) has reported for three members of the family Amaryllidaceae, *Galanthus nivalis*, *Leucojum vernum*, and *Agave densiflora*, that the longevity of the pollen was increased over that in air-dry condition by storage in desiccators over sulphuric acid (humidity about 1 per cent) and even more in an atmosphere with 30 per cent humidity. Holman and Brubaker (1) gathered together all previous data, including six additional forms in this family, of which two (species of *Lycoris*) were found to live longer in the most favorable humidity than when air-dry. On an average, of all Amaryllidaceae tested in both conditions, pollen remained viable for an interval more than twice as long in the most advantageous humidity as in dry storage.

The results of experiments on storage conditions for the pollen of hybrid *Amaryllis* indicate that it too responds to constant humidities, especially favorably when in lower temperatures. The best results were secured when pollen was stored in humidities of 35, 50, or 65 per cent at 10° C. (50° F.). Of these, the intermediate

humidity appeared the most favorable, with germination percentages between 50 and 74 for different lots of pollen after four months storage. Less satisfactory results were obtained after this interval in calcium chloride desiccators at the same temperature, and in containers with 35 and 50 per cent humidity at room temperature. Pollen stored over calcium chloride or sulphuric acid at room temperatures gave low percentage germination after two months and none in three months.

Pollen was also stored in gelatin capsules in cold rooms with temperatures of -10° , and 1° C. (14° , and 34° F.). In comparison with the desiccator series at 5° C., the percentage in the capsule set at the last temperature was lower after two months' storage, indicating that the control of humidity was an important factor in determining the length of life. Satisfactory germination occurred in the other temperature, even after four months, with percentages ranging from 32 to 67 in different samples.

For ease of manipulation, storage over anhydrous calcium chloride at 10° C. may appeal to the grower, even though germination is less. Where long storage and higher germination are important, the container for the intermediate humidity may be made up by using a desiccator with an upper portion separated by a wire netting from the basal portion in which a solution consisting of one volume of concentrated sulphuric acid to two volumes of water is placed. Care is necessary in handling this acid solution, and especially in making sure that it does not come in contact with the pollen samples, which may conveniently be placed in glass vials upon half of a small glass petri dish. Experiments are in progress on other materials which may be used satisfactorily in desiccators for pollen storage.

All germination tests were made in hanging drops of a nutrient medium in a moist chamber, with counts made of pollen grains germinating and failing to germinate in a representative number of fields under the microscope. No check by means of pollination of flowers and setting of seed has been tried.

A fuller account of the experiments on pollen and data on *Amaryllis* and *Lilium* is to be published in a spring number of the Contributions from Boyce Thompson Institute.

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A CONVENIENT DESICCATOR FOR STORING POLLEN

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In the past the effective pursuit of the amaryllid breeding program has been hampered to a great extent on account of the lack of the desired kind of pollen at the particular time when needed. In practically all cases crosses were only made when flowering periods overlapped. Recently attempts have been made to rise above this handicap by storing pollen for future use.

A number of workers, beginning in 1886, have published facts about the longevity of hemerocallis and amaryllid pollen. This information is tabulated together with data concerning other plants in the valuable paper by Holman and Brubaker (1), who have also added original data. The data concerning hemerocallis and amaryllids are given in Table 1, below.

TABLE I. Longevity of Hemerocallis and Amaryllid Pollen
(From Holman and Brubaker)

Species	Reported by	Longevity in days	
		Air dry	at most favorable humidity
Hemerocallis flava	Rittinghaus	76	
Hemerocallis fulva	Pfundt	42	76
Haemanthus puniceus	Molisch	30	
Lycoris aurea	Tokugawa	21	75
Lycoris radiata	Tokugawa	9	62
Narcissus poeticus	Molisch	72	
Narcissus pseudo-narcissus	Mangin	28	
Brodiaea capitata	Holman and Brubaker	10	38
Brodiaea grandiflora	Holman and Brubaker	55	111

The method for pollen storage first used by the writer, which his friends also took up, was not entirely satisfactory. It consisted of storing the amaryllid pollen in an enclosed space over anhydrous calcium chloride. The chemical was placed in the bottom of the bottle or a half pint mason jar, some cotton was then placed over this and the pollen which had been collected in gelatine capsules was placed on the cotton. The container was then tightly closed. Over anhydrous calcium chloride, the relative humidity will remain at the zero point. This method was brought to the writer's attention some years ago when Dr. Thomas Bregger¹ sent pollen of *Rubus rosaefolius* to him from Puerto Rico. For the storage of amaryllid pollen this method was better than storage at room temperature and humidity conditions, but was far from satisfactory. Attempts were next made to store pollen at lower temperatures and humidities. In the customary electric refrigerator a temperature around 10° C. (50° F.) may be secured. If this is not available the pollen may be stored in the basement or cellar where a temperature somewhat near 20° C. (68° F.) may be had. The humidity conditions were regulated by means of saturated salt solutions in an inclosed space (3). These were found superior to various concentrations of sulfuric acid (4, 2) on account of possible burns if the same should come in contact with the hands, and theoretically these sulfuric acid solutions would change slightly each time the container was opened. The latter was the least important of the objections in this case since a slight variation in relative humidity would make little or no difference.

The saturated salt solutions were poured into the bottom of half pint mason jars to the height of about ¼ inch, and a pyrex beaker which just fitted into the mouth was placed over the solution. The pyrex beaker fitted quite securely into the mouth so that there was only slight movement, and the possibility of splashing the salt solution was reduced to a minimum. The pollen which had been collected in gelatine capsules was placed in the pyrex beaker, and the container was then securely sealed with a spring clamp which is a feature of the type of mason jar used.

The salt solutions used, and the relative humidities maintained at the temperatures indicated, are given in Table 2.

TABLE 2. Method for maintaining constant humidity by means of saturated salt solutions (Data from International Critical Tables)

Saturated salt solution	Humidity in enclosed space	
	Temperature	per cent Humidity
ZnCl ₂ . 1½H ₂ O	20 C. (68 F.)	10
LiCl . H ₂ O	20 C. (68 F.)	15
CaCl ₂ . 6H ₂ O	10 C. (50 F.)	38
	20 C. (68 F.)	32.3
MgCl ₂ . 6H ₂ O	10 C. (50 F.)	35
	20 C. (68 F.)	32.5

¹Now Sugarcane Physiologist, Florida Agricultural Experiment Station, Everglades Station, Belle Glade, Fla.

The best results were secured when pollen was stored at 35-38 per cent relative humidity and a temperature of 10 C. (50 F.). The results were judged from seeds secured from actual pollinations made with stored pollen. No attempt was made to determine the maximum longevity of the pollen.²

The most useful size of gelatine capsule for our needs was No. 000, manufactured by Eli Lilly & Co., Indianapolis, Ind. Nos. 1 and 3 were also used when smaller sizes were desirable.

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HISTORY OF HIPPECORIS GARFIELDII

ROBERT T. VAN TRESS, *Horticulturist*,
Garfield Park Conservatory, Chicago, Ill.

Hippecoris Garfieldii is the result of a cross I made in 1932 at the Garfield Park Conservatory between a red *Hippeastrum* hybrid and *Lycoris aurea*. The object in view was to create a hardier form of the amaryllis since *Lycoris* may be grown outside as far north as Ohio. This cross was made reciprocally and seedlings of both crosses started to bloom 19 months from date of sowing.

A complete record was kept during their second blooming season on all the flowers produced by these bulbs—number of scapes produced, number of flowers in an umbel, duration of blooming period, height of flower, color, and size. The *Fischer Color Chart*, approved by the American Amaryllis Society was used in determining the colors. From 68 bulbs of *Hippeastrum vittatum* hybrid* x *Lycoris aurea* 40 or 59% produced 3 or more flower-scapes with an average of 4 flowers each at an average height of 30½ inches. There were 7 bulbs that produced 4 scapes each, resulting in a total of 16 flowers per plant. These blooming periods came at fairly regular intervals—namely during January, February, July and August. However, there were some flowers visible from December 8th until the first part of September with the exception of a few weeks in April. The colors varied from lighter orange red through light orange red to dark orange red. The dominance of the pistillate parent (a red amaryllis) was indicated by the size, color and kind of seed produced.

50 bulbs of *Lycoris aurea** x *Hippeastrum vittatum* hybrid produced only 14% with 3 flower-scapes, the average number of flowers being only 3 and the average height 28 inches. These plants were uniformly less vigorous and the flowers much lighter in color varying from orange to light orange red and being smaller in size. The dominance of *Lycoris aurea* was apparent in the color and size but none of the botanical characters such as round seeds which seems unusual.

Seedling #30 of the *Hippeastrum vittatum* hybrid x *Lycoris aurea* was selected as the type plant, being the most perfect in shape and a clear orange red with a little pale orange at the throat. It bloomed first from January 10th to 23rd with 4 flowers; January 31st to February 10th it produced 4 flowers; June 15th to 23rd with 3 flowers, and September 1st to 10th with 4 more. (These dates show the day from which the first flower was fully opened until last flower showed indications of wilting.)

I selected 11 more bulbs of this cross which met the standards set by the type plant and 13 more differing only in having more of the pale orange at the throat.

²After this paper was already prepared, the very valuable paper by Norma E. Pfeiffer, "**Storage of Pollen of Hybrid Amaryllis**" was received for **Herbertia**, and which precedes this article.

* Seed parent is given first, followed by pollen parent.



Garfield Park Conservatory

“Hippecoris Garfieldii”

Only offsets from these bulbs will be disseminated as the new bigeneric hybrid *Hippecoris Garfieldii*.

Mr. August Koch, Chief Horticulturist of the Chicago Park District, thinks the chief value of the new hybrid is in establishing a break in the amaryllis which should prove of value in future hybridizing. The free-blooming habit is the chief characteristic since they were in bloom nearly continuously for 8 months. The vigorous habit, upright foliage and vitality of the plant is noteworthy. However outdoor trials will be necessary before its value can be established. Due to its better facilities for carrying out these trials the American Amaryllis Society was selected and given full authority to disseminate when sufficient bulbs are available.

EDITORIAL NOTE. *Hippecoris Garfieldii* bulbs potted in the early winter in Florida almost immediately formed roots and produced abundant foliage. Some of the larger bulbs produced flowers in the early spring. These were of the Decorative Type and very beautiful. The easy forcing habit is really a valuable character for the breeder to consider, and for that reason the Society will propagate by stem cuttage so that stock may be made available to all members interested.—Hamilton P. Traub.

COOPERANTHES

SYDNEY PERCY LANCASTER, *Secretary,*
Royal Agricultural & Horticultural Society of India, Calcutta

I was still an apprentice under my father when he died in 1904 and on running through his Bulb Book I came across some notes about hybrids raised between *Cooperia* and *Zephyranthes* which he had named *Coozephyr*. The actual plants were never found and I do not understand how only three seedlings of these crosses flowered, perhaps the rest would have bloomed in 1905-06 as the cross was made in 1902-03. These were my father's three:—

Coozephyr rosea—*Cooperia Drummondii* x *Zephyranthes carinata*
C. Lancastrae—*C. Oberwettii* x *Z. robusta*
C. Sunset—*C. Drummondii* x *Z. Andersoni*

The *Zephyranthes* in every case being the seed parent.

In 1905 I tried my hand at crossing these two genera, actually with a desire to obtain coloured *Cooperia* which would open in the afternoon. I might here say that though many of the hybrids show rather a swollen bud at night-fall all open in the morning.

These are what flowered in 1907,—

Cooperia Drummondii x *Zephyranthes robusta*; named *bella*
Cooperia Oberwettii x *Z. Tretiae*; named *blanda*

Again ill luck dogged my footsteps and through the carelessness of the mali (gardener) I lost—the plants were actually distributed to some unknown party—my hybrids.

The year 1909 saw me with a further attempt and in 1911 four flowered and commenced the long series of hybrids from which my collection has come.

Alipore Beauty (*C. Oberwettii* x *Z. robusta*)
Mary (*Z. robusta* x *C. Drummondii*)
Percy (*Z. citrina* x *C. Drummondii*)
Sydney (*C. Drummondii* x *Z. citrina*)

The Royal Horticultural Society (London) very kindly published a short note on these hybrids in Vol. 38 (page 531) of their Journal and renamed the bigeneric cross *Cooperanthes*.

In those early years I gave no thought to genetics and Mendelian laws and certainly could not have kept correct tab on my crosses. The first results were so fascinating that I crossed right and left using any *Zephyranthes* on any *Cooperanthes* with the result that a very mixed progeny is the result of self pollination now.

When I first joined the Society (1902) we had a very good collection of Lilies, my father went in for cross breeding amaryllis on a large scale and had a wonderful collection of *Crinums*, etc. In *Cooperia* we had *Drummondii* and *Oberwettii* (*pedunculata*). In *Zephyranthes* the following,—

Andersoni (*texana* ?), copper and yellow, flowers small
sulphurea (*citrina*), yellow, flowers small
candida, white, flowers small
carinata (*Wrightii* ?), lilacy-pink, flowers medium
robusta (*Lindleyana* ?), deep rose red, flowers large
rosea, deep pink, flowers small
verecunda, white, flowers erect, flowers medium
Treatiae, white flushed pink like *candida*, flowers small

The difference between *Cooperia* and *Zephyranthes* is not very great. The former open in the afternoon and have white primrose scented flowers, small in size and erect in growth. The stigmatic surface is slightly trifid but a swollen blob with the anthers pressed to the style just below the stigma, the perianth tube is long and narrow. In *Drummondii* the foliage is covered with a bloom.

Zephyranthes on the other hand open in the morning, have foliage varying from an eighth to a quarter inch or more in width and of various lengths. The flowers are slightly nodding, more or less funnel shaped, (except in *verecunda*), the stigma is trifid and the anthers are on long filaments away from the style.

I did not have to wait for a second generation before I obtained results for even in the first generation *Alipore Beauty* was *Z. robusta* in size and general appearance; *Mary*, a *Cooperia*, and *Percy*, intermediate. I have therefore placed all such as resemble *Z. robusta* in size in the *R class*; such as are erect and like *Cooperia* in the *C class* and those intermediate between these two in *CR class*. A miniature has put in an appearance, like a small *Cooperia*; and a class having sometimes one and on occasion two basal lobes, each petal being sagittate. This gives the flower a fuller appearance. This *Eared* type is to be found in both *R and C classes*.

Originally the shades of colour were white, pinks and yellows, then combinations between the pinks and yellows became possible and some lovely orange and salmon shades have come about. The bulbs vary in size and shape, some are globular and others barrel shaped, the majority increase rapidly by offsets but I have found the finer colours refuse to increase their kind and these invariably get attacked by a fungus disease. The bulbs if planted just below the surface gradually work their way down to the right level, in the majority of cases going 6 inches below ground level, the contractile roots in a couple of years pull the bulbs down.

In addition to the great variety of colour found in the *Cooperanthes* there is the wonderful trait of a flush of flower coming away within thirty-six hours of a shower of rain. From March onwards we can count on these bursts of flower and even during the Monsoon if there should be a few dry days and then a downpour the *Cooperanthes* will be up.

Some years back I attempted crosses between *Cooperanthes* and *Cyrtanthus*, *Albuca*, etc. The only success I got was a batch of *Cyrtanthus* fertilised by an out of season *Cooperanthes*. These bulbs grew for a year or two but never made any size, increasing by offsets till they died out.

Looking up my Bulb Book I find that the *Cooperanthes* which I have growing in lines down some of my propagating frames number,—Yellows 193, Pinks 160, Orange 65, White 42 and Ajax type 35. These large numbers, would be greatly reduced if a check were made for the best of each class but, where they are now, each provides a patch of colour without interfering with anybody.

The whites are either pure white or tinged with a soft rose or cream fading to white. These are the best six: *Emperor*, *Ida*, *Clara*, *White Queen*, *Peter Pan* and *Satyr*.

In pink the shades range from a soft rose to a deep carmine red, these six are excellent: *Alipore Beauty*, *Prince of Wales*, *Jupiter*, *Enchantress*, *His Majesty* and *Mary*.

Yellows have come from *Andersoni* and *citrina* and the shades range from a deep yellow to a pale cream. The best six are these: *Queen Mary*, *Star of Alipore*, *Gold*.

finch, Rheingold, Canary Bird. We now come to the Orange shades which unite the pinks and yellow series. My best are *Goliath, Dog Star, Ballet Girl, Autumn Tints, Lancasteri* and *Hereward*.

One great fault with all the *Cooperanthes* is the very fugitive nature of the colours, early in the morning you could not wish to see finer shades of pink, yellow and orange but by nine o'clock the sun has bleached the majority to a white.

Z. verecunda fertilised by *sulphurea* gave me a pale yellow that later was identified as *Ajax* obtained from a Dutch source. I have for years tried to combine pink shades with *verecunda* and its hybrids but with no effect. This variety is extremely shy of seeding and though I have 35 *Ajax* seedlings named, these differ in size and shade to a large extent. I hardly think it wise to include any names in this article which is about *Cooperanthes*. One reason too that prevents much being done with *verecunda* and *Ajax* is that this type of *Zephyranthes* flower late in the season when the best flushes of both *Zephyranthes* and *Cooperanthes* are over and owing to the moist climate of Bengal pollen cannot be kept for any time.

Among the *Zephyranthes*, *sulphurea* bears seed freely, and on occasion *carinata*. I have seen a seed pod on both *rosea* and *candida* but the seeds were not fertile and *robusta* never seeds on the plains. It is different on the hills where all these bear seed.

THE CONSTITUTION OF AMARYLLIDS

WYNDHAM HAYWARD, *Florida*

One of the most important factors in the success that a grower may achieve with various types and varieties of amaryllids, and the one most generally overlooked or disregarded, is that of the constitution or inherent vigor or weakness of the plant.

Hybrid amaryllis seedlings are particularly subject to variation in this regard. This is apparently due to growing them under pampered greenhouse conditions which are foreign to those under which the species developed. For instance, seedlings raised in the open field under the full sun in Florida undergo a very rigorous natural selection process wherein only the "fittest" survive—those having the most vigorous constitution.

It is not unusual for a Florida amaryllis grower raising his seedlings in the open field in full sun to lose from 15 to 35 per cent of his seedlings in the course of the three or four years usually required to bring the bulb crop to blooming size. Under shade this percentage is somewhat lower.

In the greenhouses of Europe, especially in England and Holland, and lately in the United States, extensive breeding work and the raising of thousands of seedlings of hybrid amaryllis have been carried out. Usually these breeding experiments have been carried out with special emphasis on such characters as color, shape and size of blooms, with little attention paid to the inherent vigor of the bulbs produced. Many more seedlings are raised to blooming size that are of weak constitution than would be the case under outdoor sub-tropical conditions.

It is the observation of the writer that the best types of blooms in shape, color and size, are all too frequently borne on bulbs of less vigorous types. Many of the best bulbs from the bloom quality standpoint are constitutionally very weak.

This unfortunately leads to difficulties in rooting, blooming and setting seed on bulbs of this character, when transplanted, especially if dried off and cured for commercial sales. One of the important items for breeders to stress in the future creation of hybrid amaryllis strains will be the selection of vigorous types, at the same time, retaining the best colors, types and size of the good flowers we have today.

As might be understood, when breeding for specific characters, as in the quest for pure whites, which is an important and romantic page in the history of amaryllis breeding, many times the hybridizer undoubtedly had to use a flower type for male or female parent, that was by no means ideal or desirable from the standpoint of bulb constitution and vigor. It is particularly in the pure whites that this lack of vigor in the bulb is noticeable. The writer has never seen an absolutely pure white (excepting light green) of good shape, size and texture which came from what could be described as a robust bulb.

The reds seem to make the most vigorous bulbs, even under greenhouse conditions. Bulbs of pure whites imported from Holland, and others obtained in this country, sometimes refuse to become established with a good root system the first season under best cultural conditions in Florida. Frequently they bloom, but do not have strength to set seed, and the bulb is badly wasted away by its effort of blooming without an established root system, sometimes to such an extent that it will not bloom again the next spring.

Outdoor grown bulbs, from the "survival of the fittest" process in nature explained above, which operates through the hot sun, drought, blight, insects, etc., are much to be preferred over greenhouse bulbs for vigor in most cases, although a certain percentage of greenhouse bulbs are of equal vigor with the best of the outdoor kinds as is natural.

The largest and most vigorous of the outdoor grown bulbs are usually of poorly shaped and inferior types of flowers in hybrid *Amaryllis* although this is not invariably true. There are many cases of choice bulbs purchased from greenhouse collections, and planted in outdoor gardens or under field conditions in Florida, with no success, the bulbs refusing to grow a good root system, and sometimes even failing to bloom at all, but wasting away with every season until they vanish completely, despite the best of cultural care. This seldom happens with outdoor-grown and vigorous types of the bulbs when planted under the same conditions.

Other bulbs having a difficult constitution are: some of the *Hippeastrum* species, notably, *H. reticulatum* var. *striatifolium*; *H. equestre* (under greenhouse conditions); *H. rutilum* and varieties, *Nerine curvifolia*, var. *Fothergilli major* and certain hybrid nerines; certain *Hymenocallis* species; a few *Zephyranthes*; the double variety of *Hippeastrum equestre* (a very difficult item to handle successfully). Of course it should be understood that all the above, under conditions which just suit them, perform wonderfully, and behave in every way satisfactorily, and these special requirements are usually simple and self-explanatory. Nevertheless, they react differently in their way from other amaryllids, and are usually rather baffling to all but experienced horticulturists.

AMARYLLID POLLEN GATHERING INSECT

HAMILTON P. TRAUB, *Florida*

The amaryllid breeder is confronted with a real problem in outwitting a pollen gathering insect, *Halictus (Chloralictus) reticulatus* Robertson.³ It seems to be particularly fond of *Hemerocallis* and *Zephyranthes* pollen, but apparently collects pollen of all the other amaryllids when available. It does not become a problem until about May and June so that the early flowering amaryllids are safe from this pest. The insect begins very early in the day and during the summer one must collect the pollen at 5 A. M. or earlier from any open flowers to keep it from them. Even flowers which are only slightly open are entered and the pollen may be all stolen before the flower is fully open. These insects may perform the function of transferring pollen to the stigma in some instances, but this apparently is only accidental since most amaryllids in the writers collection will not set seeds during the summer unless artificially pollinated.

The method of collecting pollen by the insect is quite interesting. The head is used to pry into the anther cavities or locules even before these normally begin to open; either one or both fore legs are used to pick up the pollen grains which are then passed swiftly to the second leg or pairs of legs which transfer it to the crooks of the hind pair of legs where it is collected in masses by a firming down action of the middle pair of legs.

Their work is so efficient that by 8 o'clock or earlier in the morning all the pollen is gone except in cases of stray pollen grains which may have fallen on the lower inside of the tube or segments. This may sometimes be sufficient for use to effect pollination, but as a rule the hybridizer looks in vain for the needed pollen.

³The insect was identified by Miss Grace Sandhouse of the Division of Fruit Insects, Bureau of Entomology and Plant Quarantine, U. S. Dept. of Agric.

The method used by the writer to outwit the insect, is to gather the anthers just before the flower opens. The anthers are collected in a size No. 2 gelatine capsule and are then stored in an improvised desiccator⁴ for future use.

BURBANK AMARYLLID CATALOG, 1909

WYNDHAM HAYWARD, *Florida*

Through the kindness of Mr. J. B. Pettit, postmaster for many years and veteran amaryllis fancier at Fruitland, Ontario, Canada, we have received a copy of the late Luther Burbank's "First and Last Amaryllis Bulletin", dated August, 1909, and which is entitled "A Brief Descriptive List of the New Burbank Giant Amaryllis." The booklet, of some 16 pages, is illustrated with three interesting plates. The first plate shows a typical Burbank amaryllis, which can be described as pretty fair, but no better. The second plate shows sample blooms of the "lighter shades" growing in the open field. The third plate shows "A new Hybrid Amaryllis—Martinique," which the booklet sets forth to be a "remarkable new hybrid of the *Sprekelia Formosissima* or Jacobean Lily with the Amaryllis (*Hippeastrum*) *Vittata*."

Because of the rarity and interest of this catalogue, I reproduce below the rest of the text under this plate of a purported *Sprekelia-Hippeastrum* hybrid, one of the most unique hybrids which have been produced among the bulbous plants. The flowers are fiery crimson like those of the Jacobean Lily, but very much larger, being nine inches in diameter, but even more remarkable are the long, curious twisted petals which give the flowers a strange appearance, not found anywhere else among the Amaryllideae. Leaves pale green, upright, strap shape, 1 inch wide, 18 to 20 inches long. Flowers fiery crimson on slender stems 1½ to 2 feet long. Usually two flowers to each stem.

"I have now produced 58 large bulbs and 57 small ones, of this new hybrid. Price for the whole stock without reserve, \$350.

"Seed capsules are produced abundantly, but rarely a viable seed. Have so far secured twelve from which are now growing twelve seedling bulbs, which are now large enough to bloom next season. Price of the twelve, \$240."

The address given on the catalogue is "Burbank's Experiment Farms, Santa Rosa, Cal., U. S. A." The phraseology indicates that Mr. Burbank was endeavoring to sell out all his amaryllis at that time, or at least his entire stock listed.

"Thirty Years ago my work commenced on the *Hippeastrums* or Amaryllis," Mr. Burbank writes in the introduction, "as they are more commonly called, and though I have sold from time to time the more ordinary kinds of my seedlings, having quite large flowers, to the seedsmen and florists, yet have kept the very best varieties for increase and to name and introduce later, and now have a good stock of each of these distinct new varieties; the cream of the hundreds of thousands which have been raised during all these years.

"This rare collection is now for the first time offered, each variety with complete control including all the bulbs in existence. In other words, the varieties are sold very much as a patent is, the purchaser has absolute control of the varieties purchased," . . . "This will be the last opportunity ever offered to purchase this collection or any part of it. Nearly everybody knows of it, but no one possesses a single bulb of any variety of this whole collection . . ."

There are just 136 "brief but accurate descriptions of the new Amaryllis" in the list. Of some there are as many as 120; 163 and 227 bulbs offered. Prices range for the complete lots of the different varieties, from \$5.00 for 3 bulbs up to \$240 for 120 bulbs. There is great difference in the prices as regards the quality of the individual bulbs. Most of the flowers are described as being 7 to 8 or 8 inches across. A few 8 to 9 inches and a number 5 or 6. No names of the varieties are given except "*Martinique*," the hybrid between *Sprekelia* and *Hippeastrum*.

The membership of the Society is greatly indebted to Mr. Pettit for preserving this interesting catalog and allowing us to review it for the Year Book. It is first

⁴Traub, Hamilton P. Convenient Dessicator for Storing Amaryllid Pollen. *Herbertia*, 1936.

hand data on an interesting period in American amaryllis history more than a quarter of a century ago.

The following are two average descriptions of varieties from the folder: No. 92 "Broad, flat, regular petals. Tips of petals scarlet, each petal heavily banded and flaked with white, and veined and shaded crimson. Enormous flower, handsome. 4 flowers to a stalk. Flowers 9 inches across. Height 20 inches. 9 bulbs \$60.00." No. 120 "Whitest of all my seedlings, pure white throughout, with faintest greenish tinge. Some petals lightly lined crimson. Light green foliage, remarkably large and strong. 2 flowers to a stalk. Flowers 5 to 5½ or sometimes 6 inches across. 4 bulbs. \$35.00."

(NEW YORK FLOWER SHOW—Continued from page 44)

The results in the other two usual Amaryllis classes were:

(a) *Amaryllis*, 12 plants in flower, one bulb in a pot,—

First: Mrs. John M. Schiff, Oyster Bay, L. I., N. Y.

Second: Mr. Samuel Salvage, Glen Head, L. I., N. Y.

(Exhibitors in class of 12 plants cannot enter in class for 6 plants in pots.)

(b) *Amaryllis*, 6 plants, one bulb in a pot,—

First: Mr. J. P. Morgan, Glen Cove, L. I., N. Y.

Second: Miss Marie L. Constable, Mamaroneck, N. Y.

In the classes for clivia plants, Mrs. Henry Morgan Tilford of Tuxedo Park, N. Y., and Mrs. W. R. Coe, of Oyster Bay, N. Y., divided honors.

John Scheepers, Inc., of New York exhibited a notable collection of hybrid Amaryllis in the commercial displays, including a group of excellent pale salmon flowers, and several pure whites. There was also an unusual orchid-colored type. Part of the Scheepers display was set up in the form of a shadow Box, with striking effectiveness.

The following brief quotations regarding the 1936 Amaryllid displays at the New York show are from horticultural papers:

The Florists Exchange: "Among the many trade exhibits one that stood out emphatically was a large shadow box or more than a score of Amaryllis plants arranged by John Scheepers, Inc., of New York and Brookville, Long Island." . . .

Also . . . "We missed the gigantic Harrisi Lilies of other years, but the Amaryllis made up for them. New York never before saw so many really choice Amaryllis—*Evidently the Amaryllis Society's work is bearing fruit*—as one visitor remarked 'after seeing these I feel like throwing mine away'."

Gardeners Chronicle (N. Y.) . . . "Amaryllis has at last come into its own at the New York Show and gorgeous types were exhibited by Mrs. John M. Schiff, F. Kirkham, Gardener, which won easily."

(NEW DAYLILIES—Continued from page 95)

both the sepals and the petals is somewhat tinged with red. The general color effect is noticeably different from that of Theron and Vulcan, which are also of the dark red class, and all of these are much darker than Rajah. The flower is medium full, medium large (from 4 to 5 inches in spread), the petals and sepals are broadly recurving, and the form and color is well maintained during the day. The somewhat robust foliage and the erect, much branched scapes give a good habit of growth and the plant is fully hardy at New York.

This daylily has in its ancestry the species *Hemerocallis Thunbergii*, *H. aurantiaca*, and a certain plant of *H. fulva* from the wild and it was obtained after several generations of selective breeding. The name Wolof refers to a native tribe in Africa and is here applied to suggest that the plant in question is one of the dark-colored type of daylily.

The above is the first mention and description of this particular daylily to appear in print.

—A. B. STOUT.



Chas. T. O'Rork, Jr.

*Growth Responses following stem cuttage of
hybrid amaryllis*

For explanation see text

5. PHYSIOLOGY OF REPRODUCTION

AMARYLLID PROPAGATION BY TERMINAL BUD DESTRUCTION¹

I. W. HEATON, *Florida*

There is among the Amaryllids a group of plants, which can be propagated by destroying the terminal bud. This group includes *Agapanthus*, *Clivias* and *Hemerocallis*. From a commercial standpoint it may not be profitable to propagate *Agapanthus* vegetatively, but more uniform types could be produced in this way than by the closest roguing. In *Clivias* with great seedling variation and value depending on type, propagation of these plants will pay large dividends. For *Hemerocallis* this would only apply to new varieties where rapid increases are needed.

The principle of this method is destruction of the terminal bud without damage to foliage. The details of the method are varied to suit the type of plant.

Agapanthus may be propagated any time except just prior to flowering, at which period the side buds are already formed and no increase is obtainable. *Clivias* must be treated just before the flowering period, prior to flush of growth. *Hemerocallis* respond best just following the flowering season.

Method of Bud Destruction. For *Agapanthus* and *Clivias* use a No. 2 steel knitting needle or a straight piece of No. 12 wire. Heat only the tip to a dull red, insert into the axis of the leaves, pushing it quickly in a vertical line with the stem until the needle has burned completely through the plant. It is important that this operation be done quickly to prevent damage to tissue beyond the bud cells. *Hemerocallis* require a little different treatment on account of the length and diameter of the stem. A short piece of No. 022 steel wire heated as above is inserted slightly above the leaf base, pressed through the stem from side to side at an angle of 45 degrees to intersect the bud. This treatment does not disturb either the foliage or the roots and throws the entire energy of the plant into offshoots, as no further growth can be made from the terminal bud. It is analogous to topping a plant to induce branching.

Results. *Agapanthus* produced 16 buds from one plant in five months, and would have made more but I had cut away all of the old base with the new plants. The top was still alive on only a slender section of stem. *Clivia* produced five new plants in the same period; while *Hemerocallis* made eight, both the latter plants are still alive and in the case of the *Clivia* more offsets are forming.

GROWTH RESPONSES FOLLOWING STEM CUTTAGE OF AMARYLLIDS

HAMILTON P. TRAUB, *Florida*

At the request of several correspondents two points which were not considered in detail in former papers on the stem cuttage method of propagating amaryllids are briefly discussed. These concern the nature of the sprouting medium and the type of growth responses secured after stem cuttage.

The most commonly used sprouting medium is a mixture of granulated German peat and coarse sand in equal proportion. (1, 2, 4, 5). This mixture is fairly

¹See also Hayward, "Naturalizing of *Eucharis* and *Clivia*." Year Book American Amaryllis Society, 2:136. 1935.

satisfactory if proper drainage is provided and the cuttings are not kept too wet. Usually the stem cuttings from the upper part of the bulb decay in this medium. Pure, coarse sand if not kept too moist is equal to the above (3). Recently the writer has used a mixture of granulated German peat, coarse sand and broken rock, $\frac{1}{4}$ " mesh, in equal proportions. With good drainage, this medium has given best results so far. This mixture apparently provides the necessary aeration, and the mechanical bruising of the rock seems to stimulate growth responses. The neutralizing effect of the carbonate rock has a tendency to keep the medium at the proper effective acidity, which should be near the neutral point, pH 6.5 to 7, for best results.

The stem cuttings are planted with the upper end of the fractional leaf scales slightly out of the medium. Excepting in the case of such genera as *Narcissus*, in which the leaf scale fractions attached to the stem fraction elongate and turn green soon after planting in the fall (3) photosynthetic activity probably is not of much importance from this source.

The growth responses vary with the plant material, the time of cutting and the sprouting conditions. In this brief paper we will consider only a typical case of a hybrid amaryllis (*Hippeastrum*) bulb, $2\frac{1}{2}$ " in diameter, cut into 96 stem fractions. The bulb is first cut into 16 parts vertically and each of these is then cut into 6 parts horizontally. Larger bulbs may be cut into a proportionally larger number of stem cuttings.

After planting, any developing bulblets apparently draw for nourishment on the reserves of not only the leaf scale fractions but also on the stem fraction giving it an advantage over the method of leaf scale incubation (2) in which case there is only a small fraction of the stem attached to the leaf scale fraction.

The fractions from the bottom of the bulb usually show the most rapid response, Figs. 3a and 3b, and there is early root development from the stem fraction as previously pointed out (3). Bulblets usually develop beneath the leaf scale.

The fractions from the intermediate region of the bulb, Figs. 1a, 1b, and 2b, show fairly rapid response. As a rule the bulblets develop between the leaf scale fractions. In Fig. 1a, the tiny bulblet is just prying the scales apart; in Fig. 1b, the bulblet has enlarged and the scales are spread apart. In Fig. 2b, the bulblet has formed above the leaf scales which is unusual, and the first root from the stem fraction is also shown.

The fractions from the top of the stem or bud are the most difficult to sprout and many of these will perish unless great care is taken in cutting the bulb at the proper time when the stored food reserves are at a maximum, and providing the proper effective acidity, pH, of the sprouting medium, and the best of drainage and soil aeration. In Fig. 2a is shown the type of growth response in this case which lags behind that of the other fractions. The bulblet usually forms above the leaf scales as shown in this Figure.

At times, especially when the bulb is cut too soon after flowering before the bulb is fully matured, the scale leaf fractions will die off, leaving only stem fractions. These will sprout as a rule in many cases although tardily, as shown in Fig. 5.

In rare cases a piece of leaf scale will become detached from the stem fraction, and if a small amount of meristematic stem tissues adheres to it, a tiny bulblet or two may form under favorable conditions, as shown in Fig. 6. This response is very much slower than in the case of the stem cuttings, and is equivalent to Miss Luyten's method of bulb scale incubation (2), however, under her recommended treatment these tiny bulblets grow somewhat faster than under the ordinary lath-greenhouse conditions used in Florida.

The growth responses following stem cuttage in amaryllids after several months, are shown in Figs. 4a and 4b. It will be noted that the root development is primarily from the stem fraction, and only later do roots grow from the base of the new bulblet. This type of rooting will explain the superiority of the method of stem cuttage over others. The bulblet gets off to an early start from an ample food supply stored in the leaf scales and stem fraction, and then the root system is developed at an early stage in the life of the bulblet which then forms relatively large leaves which function in carbon assimilation. Under proper treatment bulbs from July cuttings, properly fertilized in the propagation flats and transplanted early the following spring, will bloom in 22 months in the case of spring flowering varieties.

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NOTES ON THE VEGETATIVE PROPAGATION OF AMARYLLIDS

I. W. HEATON, *Florida*

The groundwork for an effective program of vegetative propagation of amaryllids has been laid by various workers in previous contributions. In 1926 Miss Luyten published on the subject of the vegetative propagation of *Hippeastrums* by the method of leaf scale incubation (3) and this work was verified in 1927 by the Missouri Botanic Garden (5). In 1933 Traub published an article on the propagation of *Hippeastrum* by stem cuttage (6), and this was followed in 1934 with an additional article by the same worker in which he extended the method to other amaryllid Genera, (7) and a paper by Heaton on *Hippeastrum* propagation by stem cuttage (1). In 1935 Miss Luyten published a comprehensive article on the method of propagation by leaf scale incubation (4), and in the same year appeared an additional article by Traub (8) who gave final results for his *Hippeastrum* stem cuttage experiments and data for the vegetative propagation of *Haemanthus*, *Crinum*, *Hymenocallis*, *Narcissus*, and *Crinodonna* (*Amarcrinum*). A short note by Heaton (2) also appeared in 1935. In the present paper the method of stem cuttage is reported for still other Genera of amaryllids,—*Vallota*, *Eucharis*, *Habranthus*, *Lycoris*, *Nerine* and *Sprekelia*, and the work of Traub (7, 8) on *Amarcrinum* (*Crinodonna*), *Crinum*, and *Haemanthus* is verified.

Table showing results with various amaryllid species and hybrids.

Species or hybrid	Size of bulb Diam. "	Date of propaga- tion	Date of trans- planting	No. of Divi- sions	Size of bulblets Diam. "	Per- centage sprouted*
Hippeastrum hybrids	3"	Sept. 1	Jan. 1	64	1/2 "	85
Amarcrinum Howardi	5"	do	Mar. 15	80	3/4 "	91
Crinum giganteum	4"	do	Mar. 1	60	3/4 "	80
Crinum Ellen Bosanquet	5"	do	do	80	3/4 "-1"	72
Eucharis grandiflora	2"	do	Jan. 1	32	3/8 "	150
Haemanthus multiflorus	2 1/2 "	Apr. 1	Aug. 1	16	3/8 "	120
Habranthus advenum	2"	Sept. 1	Jan. 1	16	1/2 "	100
Lycoris aurea	2"	do	do	8	1/2 "	100
Lycoris squamigera	2"	May 1	Sept. 1	16	3/4 "	90
Nerine sarniensis	1 1/2 "	Sept. 1	Jan. 1	16	3/8 "	120
Nerine Bowdeni	1 1/2 "	do	do	16	3/8 "	75
Nerine fothergilli major	1 1/2 "	do	do	16	1/2 "	60
Sprekelia formosissima	1 1/4 "	May 1	Sept. 1	16	3/8 "	80
Vallota sp.	1 1/4 "	Dec. 1	June 1	8	1/2 "	133

*Where percentage given is greater than 100 per cent, the excess is due to multiple sprouting on some stem fractions.

It is of interest to note that the method of leaf scale incutination depends on a leaf scale segment from a scooped bulb while the stem cuttage method is based on the use of a part of the basal stem with leaf scale segments attached. The former

method is dependent on greenhouse sprouting conditions while the latter requires only ordinary lath-shade conditions in Florida. The first sign of growth occurs in three to four weeks, when the basal stem puts forth a fibrous root. These roots are similar to those of mature bulbs and reach six to twelve inches in length in four months. In six weeks the new bulbs can be seen forming at the junction of the leaf segments and attached to the basal stem portion as pointed out by Traub (6) in 1933. Bulblet development is very rapid since they are not dependent upon food in the leaf segment but are supported by the roots from the stem long before any roots appear from the base of the newly formed bulblet. This fact makes it possible to plant $\frac{1}{2}$ " bulbs in the field in January from cuttings made in August and September.

In the accompanying table are summarized the data for hybrid amaryllis (*Hippeastrum*) and also for the other Genera,—*Vallota*, *Amarcrinum* (*Crinodonna*) *Howardii*, *Crinum giganteum*, hybrid *Crinum Ellen Bosanquet*, *Eucharis grandiflora*, *Haemanthus multiflorus*, *Lycoris aurea*, *Lycoris squamigera*, *Nerine sarniensis*, *Nerine Bowdeni*, *Nerine Fothergilli major*, and *Sprekelia formosissima*.

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PROPAGATION OF ZEPHYRANTHES ROSEA BY UNDER- AND OVER-FEEDING

HAMILTON P. TRAUB AND A. E. HUGHES,
Florida

When *Zephyranthes rosea* bulbs were naturalized in high hammock woodland in Orange County, Florida, it was noticed that the increase by offsets was slow in contrast to the rapid increase secured under intensive garden culture and under pot culture with alternate drying and wetting. In order to secure data on this subject the following experiment was carried out.

The general plan of the experiment consisted of planting the controls in the open in rich gray-black podsolic soil developed under a dense growth of oaks (1,2), and subjecting one of the two treated lots of bulbs to (a) under-feeding, and the other to (b) over-feeding.

Effect of Underfeeding. The bulbs were planted in 4" clay pots in a soil medium composed of $\frac{1}{3}$ broken rock, $\frac{1}{4}$ " mesh; $\frac{1}{3}$ coarse Lake Eustis sand, and $\frac{1}{3}$ Orlando fine sand. This mixture is low in plant foods. No attempt was made to water the bulbs so that they received moisture only from rains, and were subject to alternate drying out and wetting. Under these conditions they did not bloom but vegetated as shown in Figs. 1a and 1b. After two months slender bulblets were formed in a ring around the parent bulbs, the total averaging 9 bulblets per parent bulb as shown in Table 1.

During the same period no increase took place in the case of the controls, Figs. 2a and 2b, naturalized in woodland. After 4 months a slight increase is noticed and after 12 months the six bulbs have increased to 10. It was realized that if the

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Vegetative propagation of *Zephyranthes Rosea* by systematic under- and over-feeding.

For explanation see text.



slender under-fed bulblets were again planted under the conditions indicated above, the next progeny offsets would be still more slender and for this reason the attempt to propagate by under-feeding was discontinued.

Bulbs kept in soil media saturated with water also gave better increases in a two months period than those naturalized in woodland, where no increase took place in the same period,—

Soil medium kept saturated with water	Number of bulbs at start	Number of bulbs at end of two months
Broken rock, ¼" mesh	6	10
Coarse Lake Eustis sand	6	13
Orlando fine sand	6	10

Effect of Over-feeding. The bulbs were planted in Orlando fine sandy loam, high in finely divided organic matter and containing an abundance of plant nutrients derived mainly from poultry fertilizer. This soil type packs readily when watered liberally, and aeration apparently is not of the best under these conditions. The bulbs, however, when grown in this soil medium in half shade produced an abundance of foliage as shown in Figs. 3a and 3b, as contrasted with meagre foliage in the controls, Figs. 4a and 4b. They bloomed profusely during the latter part of June and the beginning of July.

By August 12, blooming had ceased and the bulbs were removed from the soil, washed and dried on a screen. Each bulb had produced on an average of over 7 new bulblets, as shown in Figs. 3a and 3b, and in Table 1. These bulblets were removed, and all mother bulbs together with the progeny, were planted back in the same soil medium. This process was repeated on Oct. 11, Mar. 29, and July 19.

In Figs. 5a and 5b are shown offset mother bulbs which have grown for a period of two months and have again produced their quota of offsets. It will be noticed that these are somewhat smaller than those shown in Figs. 3a and 3b, but they are more plump than those shown in Figs. 1a and 1b, secured by under-feeding. Due apparently to the very rich soil medium the progeny from offset mother bulbs grow to this medium plump size no matter how long the process of replanting after separation is repeated.

TABLE 1. Showing increase in number of *Zephyranthes rosea* bulbs by the methods of under-feeding, and over-feeding with periodic separation of bulblets.

Treatment	Number of Bulbs					
	June 10	Aug. 12	Oct. 11	Mar. 29	June 10*	July 19
Controls—bulbs naturalized in woodland	6	6	8	8	10	10
Bulbs under-fed	6	54	This part of experiment discontinued			
Bulbs over-fed	6	53				
			116	332	732	945

*Interpolated from graph.

An inspection of Table 1 shows that the increases secured by the method of over-feeding amounted to 116 after 4 months, 332 after 9 months, 732 after 12 months, and 945 after 13 months from an initial start of 6 bulbs. This is an increase of 12,100 percent over a twelve months period, as shown in Table 2. In this Table are shown also the number of increase on the basis of one bulb, and the rate of increase for varying periods during the year.

TABLE 2. Effect of over-feeding on increase of *Z. rosea*; showing the number of increase on the basis of one initial bulb, the percentages of increase on various dates, and the rate of increase for varying periods during the year, when all offset producing mother bulbs are considered.

	June 10	Aug. 12	Oct. 11	Mar. 29	June 10	July 19
Number of increase on basis of one initial bulb.....	1	7.8	18.3	54.1	121.0	157.5
Per cent increase over the one initial bulb	—	780	1830	5410	12100	15750
Bi-monthly rate of increase when all bulbs producing offsets are considered....	—	7.8	1.2	0.76	0.9	0.9

The bi-monthly rate of increase was more than 7 bulbs for each of the six original bulbs for the first two months, but after this period, the rate fell considerably for the remaining time of the experiment. This is easily explained from the fact that large bulbs were used at the beginning, but after the first two months the bulblet progeny were used also thus cutting down the average size of the parents for the remaining time of the experiment. The rate remained fairly constant after March averaging slightly less than one bulb increase for each bi-monthly period.

When the time factor and the grand total of the progeny from one bulb is contrasted with that of less than 1 per cent in the case of bulbs naturalized in woodland, the great superiority of this method of propagating *Zephyranthes rosea* is fully realized. The bulbs in woodland would naturally increase to large colonies after several years. Under good garden culture the increase is quite satisfactory but could hardly compare with the outstanding total of 157 plump bulbs from one original bulb in one year.

It is interesting to note that in the case of bulbs under-fed no blooms were produced. When bulbs were over-fed, the pre-formed flower buds expanded and profuse flowering took place, but in July of the second year only about 50 per cent of the mother bulbs and a very few of the progeny flowered, showing that a certain balance of nutrients within the tissues of the plant is required for fruit (flower) bud formation as has been reported for other plants (3)

Conclusions. When rapid increase of *Zephyranthes rosea* is desired for purposes of naturalizing, or in commercial propagation, the method of systematic over-feeding is to be recommended, which gave at the rate of a total of 157 plump bulbs for each original bulb over a twelve months period. The method of systematic under-feeding gives similar results but the bulblets are much smaller and the process would soon come to an end from under-nourishment of the mother bulbs if the experiment were carried out over a period of more than a few months.

The method may be applicable to other types of amaryllids with growth habits similar to that of *Z. rosea*, but it will probably not apply to types having distinct dormant or resting periods. The principle that high feeding during the growing period is conducive to vigorous vegetative reproduction will however hold even in the latter case.

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Chas. T. O'Rork, Jr.

Propagation of Hemerocallis by crown cuttage

For explanation see text. The region where roots originate has been marked so that comparison may be made.

PROPAGATION OF HEMEROCALLIS (DAYLILIES) BY CROWN CUTTAGE

HAMILTON P. TRAUB, *Florida*

During the present season the writer has extended his stem cuttage experiments to include hemerocallis or daylilies. The anatomy of the crown of the rhizome¹⁽²⁾ in Hemerocallis is so strikingly similar to that of the typical amaryllid bulb that the same general technic can be used for both (5, 6, 7, 8).

The unit for stem cuttage of hemerocallis is the crown (3, 4), which has been described as "a part of a rhizome with a large bud" (1). In Figs. 1 and 2, the crown of the hemerocallis rhizome and the amaryllis bulb are compared in vertical section. Figs. 3, 4 and 5 show $\frac{1}{4}$, $\frac{1}{8}$ and $\frac{1}{16}$ hemerocallis crown fractions secured by vertical cuttage; and Figs. 6a and 6b show $\frac{1}{32}$ fractions secured by horizontal cuttage of one $\frac{1}{16}$ fraction.

In the initial experiments medium sized crowns were used so that there was no opportunity of determining the maximum number of divisions that may be secured. The varieties included in the experiment were the clons *Mikado* (Stout), *Margaret Parry* (Perry), *Chrome Orange* (Mead) and *Fulva Europa*, all kindly furnished by Mr. Wyndham Hayward. The growth responses following crown cuttage are similar to those of Narcissi (6). The leaf fractions on the stem or crown piece elongate, where they do not die back, soon after planting, and some sprouts appear early but most of them a considerable time later. The $\frac{1}{4}$ and $\frac{1}{8}$ fractions sprout most readily; $\frac{1}{16}$ and $\frac{1}{32}$ fractions are apt to rot unless the environmental conditions are just right. A more complete report with sprouting percentages will be included in a later issue of *Herbertia*.

The method is also being tried out with *agapanthus* and *clivia*.

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SIMPLE INCISION METHOD OF LYCORIS PROPAGATION

WYNDHAM HAYWARD, *Florida*

A year's experiment under actual garden conditions has proved the efficacy of a new and simple method for the faster propagation of *Lycoris squamigera* bulbs. This method requires no special equipment and no exacting conditions of moisture and temperature. Cuttage is used.

Two dozen *Lycoris squamigera* bulbs were incised or "mutilated" in September, 1935, in the experiment. The bulbs were cut upward from the base three or four times, deep enough into the tissue to cut clearly past the basal stem at the bottom of the bulb. The bulbs were then planted back in the ground immediately, exactly as if they had been sound bulbs.

The cuts were made so that if they had been continued upward and entirely through the bulb, the bulb would have been sliced into four or more pieces on the central axis of the bulb. All cuts were made across this axis, the knife being rotated for each successive cut.

¹"A subterranean stem producing roots below and leaves or shoots above." Practical Standard Dictionary of the English Language. F. H. Vizetelly. Funk and Wagnalls Co. N. L. and London. 1930.

One normal bulb was planted with the cut bulbs, and it bloomed on schedule in late June, 1936. The incised bulbs were dug up and examined at that time. Two of the mutilated bulbs had rotted away completely, but the remaining gave uniformly even increases of three to seven bulbs, in most cases four, five and six. One bulb produced eight small bulbs.

The new bulbs were small, about $\frac{3}{8}$ to $\frac{1}{2}$ inch in diameter, but perfectly healthy and with sound root systems. They have been planted back again for the coming growing season, and it is expected that blooming size bulbs can be obtained from them in one year more of growth.

The ground used in planting these bulbs for the experiment was ordinary thin, sandy high hammock loam, quite dry in the winter months, although in the season of 1935-36 there was an unusually heavy rainfall. The bulbs were not watered artificially more than two or three times in the winter, and they had absolutely no fertilizer applied before or during the experiment. The soil in which they were grown is normally quite fertile in nature. The results obtained are more than three times as fast as *L. squamigera* propagation by natural multiplication and division.

A pH METHOD FOR AMARYLLIS SOIL DETERMINATIONS

MRS. GEORGE M. BAHRT, *Florida*

E. R. Squibb & Sons, of New York, have put out a sensitive paper known as Nitrazine which is being used for medical determinations. The method employed requires so little work and technic, that it was substituted for the more expensive soil pH methods for amaryllis soils, with reasonable success.

For the tests, the soil samples are carefully taken with a clean knife or trowel, from at least six different places in the bed and to a depth of 6 inches. Unless the bed is spotted and certain areas are to be tested separately the samples are thoroughly mixed and the leaves and roots removed without touching the soil with the hands. 4 ounces or 113.396 grams of this soil is weighed out on oil paper and put into a pint milk bottle that has been washed and rinsed with distilled water. (Water obtainable at auto filling stations). To this soil $\frac{1}{2}$ pint or 236.59 cc. of distilled water is added. The bottle is then corked with a number 8 rubber stopper and is thoroughly shaken at 5 minute intervals for 15 minutes and then allowed to settle for 15 minutes. The stopper is then removed, and a glass rod is placed into the solution without touching the soil. The moistened rod is rubbed over the Nitrazine paper and allowed to stand for 60 seconds and then is compared with the color chart provided by Squibb and Sons. Each color indicates a degree of acidity or basicity and thus the pH is determined. For sandy soils the color for a pH of 6.0 is grayer and for 7.0 and 7.5 is of a duller blue than is indicated on the chart, but in spite of this slight difference there is no mistaking the reading. It is always well to make duplicate tests whatever method is employed. This method is accurate enough for amaryllis soils and requires little technic and is very inexpensive.

NOTES

1. For loamy soils shake at 5 minute intervals for $\frac{1}{2}$ hour and allow to settle for $\frac{1}{2}$ hour.
2. The ratio used is 1 of soil to 2.09 of distilled water. Authorities on pH's have used ratios from 1-1 to 1-25.

6. AMARYLLID CULTURE

REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.

LEUCOCORYNE IXIOIDES ODORATA

A. C. SPLINTER, *Florida*

Leucocoryne ixioides odorata is a most beautiful novelty introduced a few years ago from Chile, South America. The flowers are a beautiful sky-blue with a white star-like center, borne in umbels on a thin and wiry stem, which reaches a height of 12 to 14 inches thus making it valuable as a cut flower. The blooms possess a delicious fragrance and will last at least ten days in water after being cut. The color plate reproduced in this issue of *Herbertia* will convey some idea of the unsurpassed beauty and charm of this most welcome newcomer.

Its cultural requirements do not present any difficulties for it requires practically the same treatment and attention as is accorded Freesias. The bulbs should be planted during October or November in a soil mixture similar to that used for Petunias and Geraniums. It should be a rich mixture, but of a light and sandy nature. Clay or any other soils that "bake" must be strictly avoided. Trials have shown that best results were secured when the bulbs were started in small sized pots. Three bulbs should be planted in each 3" pot, and when the roots have filled the pots the plants should be shifted into pans or so-called azalea pots.

After planting, the pots should be thoroughly watered and placed so that further watering is not necessary until the bulbs begin to sprout. Thereafter it is important to limit the watering to such an extent that the soil appears always just evenly moist. Never should the pots become soaked for such a condition will soon start the bulbs to rot and will lead to their total loss.

The flowers begin to appear in the early part of February, and since full sized bulbs produce successively several flower scapes, the period of flowering is not less than six weeks for a group of plants started at the same time.

After flowering, the plants should be kept more on the dry side until the leaves turn yellow. Then the bulbs must be removed from the pots and stored in air dry granulated German peat in which they will keep perfectly until the next season.

The high price of the bulbs so far has practically limited *Leucocoryne ixioides odorata* to pot culture, but the day will come when outdoor plantings of several thousand bulbs will be made as a general procedure in Florida gardens. There is need of a study for large scale production of this species. Others who have had experience with it should report and in this way the foundation will be laid for further progress in this direction.

AN ALLIEAE QUARTET—BESSERA ELEGANS, MILLA BIFLORA, LEUCOCORYNE IXIOIDES ODORATA AND BRODIAEA CAPITATA

W. M. JAMES, *California*

Bessera elegans and *Milla biflora* are from Mexico. *M. biflora* is found rarely as far north as Arizona. As they both bloom in the summer and require the same culture, I will discuss them together. *B. elegans* has dainty, pendant, bell-shaped flowers in a very interesting, irregular whorl-like umbel on the tip of a graceful wiry stem 18 to 24 inches tall. The color is a bright orange red outside, creamy white with orange stripe inside and purplish stamens. *M. biflora* has snowy, wax-like hex-

agonal-shaped buds and flowers, which open flat about 2 inches in diameter and with petals not quite separated at the base. A faint stripe of soft apple green runs from tip to base on the outside of the petals. It has a pleasant lily-like fragrance. The stems are wiry, 12 to 18 inches tall, bearing 2 to 7 flowers each. Both plants have only a few long narrow leaves more or less prostrate and produce several stems from each corm. They cut well, are very interesting in flower arrangement and make a striking addition to the garden. They should be planted 4 to 6 inches deep in full sun in a medium sandy loam for best results. Good drainage is absolutely essential. They like plenty of water after growth starts until blooming time. I find in our location it is best to take the water off when the flower stems are about 6 inches high. One or two trials indicate that they can stand a good deal of moisture during the winter when they are dormant. However I doubt if they will stand many degrees of frost and think that they should be dug except in the milder climates.

The corms look very much alike except that those of *M. biflora* are a little flatter. They vary in size from $\frac{1}{2}$ to 1 inch in diameter. *M. biflora* sets seed very heavily and does not make many cormlets. *B. elegans* does not set seed so heavily and makes from 10 to 20 cormlets. The seed germinates readily in about 30 days and blooms in 3 years.

There is only one difficulty that I know of. Both are especially susceptible to *Pencilium* sp., especially during storage. This is the common blue mold that we are familiar with on lemons and it soon makes the corm a soft, watery mass. I have found dry heat the best control and use a small electric heater with a fan attached. The corms are stored in shallow trays with wire bottoms. These trays are placed in a tight compartment that can be opened a little at the top and bottom to allow circulation of air; 24 to 36 hours at 90 to 100 degrees Fahrenheit kills the mold and dries the corms. If the dormant sprout on top of the corm is not injured, it will grow and produce a new corm, even though $\frac{3}{4}$ of the old corm has been destroyed. Shallow storage with plenty of dry, circulating air is probably the best precaution. The corms are watery and bruise easily. The mold generally starts very soon after the skin of the corm is broken unless it is quickly dried. Outside of this one item, I have found these two plants very easy to grow and handle.

Leucocoryne ixioides odorata is from the foothills some 200 miles from Santiago, Chile and apparently is not very widely distributed. It has a loose umbel of fairly large flowers carried gracefully on a wiry stem 12 to 18 inches tall. The color varies from a light to a dark blue on the outer part of the petal and shades to a white in the center with large golden yellow stamens. It has a strong, pleasant nutty fragrance and lasts from 2 to 4 weeks as a cut flower. The foliage is 2 or 3 slender leaves nearly prostrate. Records show that several attempts have been made to establish this plant in cultivation in the past. It always failed until the last one, probably because the bulbs were coddled too much and kept too warm. I understand that it grows about 12 inches deep on hillsides of hard, gravelly soil in South America. Seedlings bloom in 3 years for us and go down 12 to 15 inches deep. Bulbs that have flowered do very nicely in a medium sandy loam in full sun planted 4 to 6 inches deep. I imagine drainage is rather important. So far seed seems the best method of propagation. I plant the seed in beds in the open and leave it until it flowers. Bulbs 4 years old have divided a little.

I know of no special difficulties with this bulb except for rumors that some of them have failed to come up. I think this is due to wrong handling. In its native home it frequently doesn't bloom for 2 or 3 years at a time because of insufficient rainfall. This shows it is accustomed to long rest periods under warm conditions. And it is fairly cool when it does bloom. I am quite sure too high temperatures are the main cause for failure of the bulb to come up. Night temperatures of 40 to 50 degrees Fahrenheit are probably the best under glass. I doubt if it will stand many degrees of frost when grown in the open.

Brodiaea capitata is probably one of California's most widely distributed bulbous plants. It grows from sea level to nearly tree line in the mountains and in the hot, interior valleys. I know of no especial effort to bring it into our gardens, probably because it is so widely distributed. And yet it is one of the easiest plants I know of to grow and the flowers improve so much in size and number under cultivation that you would hardly recognize it as a common wild flower. The violet blue flowers are born in a close cluster on the end of a slender stem 12 to 18 inches



Leucocoryne ixioides odorata
Glory of the Sun

high, cut well and are very attractive. Occasionally the stems are 3 feet high when growing under low shrubs. It has only 1 or 2 long narrow leaves that lie nearly prostrate. It is propagated easily by seeds, forming corms which bloom in 3 years, and slowly by cormlets.

It does best planted 4 to 6 inches deep in a medium sandy loam, either in full sun or in partial shade, but will do well in any kind of soil, provided there is good drainage. That, and a definite rest period after flowering are the only things it is fussy about. It is hardy under all except the lowest temperatures. In Santa Barbara it starts flowering 6 weeks after being planted and continues 3 or 4 months. It does equally well under glass provided night temperatures are 50 degrees Fahrenheit or under. Incidentally, rodents are especially fond of the corms.

CRINUM CULTURE IN MISSOURI

AL. G. ULRICH, *Missouri*

The name *Crinum* is derived from the Greek word *Krinon*, meaning lily. The *Crinum* species are a magnificent class of plants. Though not members of the Lily Family, few of the *Liliums* rival them in stateliness of bloom. The writer became interested in the *Amaryllideae* through receiving several bulbs of *Hippeastrum equestre* and *Crinum kirkii* and *C. fimbriatulum* from a friend in Florida. This was the beginning of his *Crinum* collection, now numbering about 28 species and over 30 hybrids, eight of the latter being his own originations. The flowers are mostly white, or a mixture of rose, red and white. The genus as a whole is found mostly in Asia, Africa, Australia and South America, a single species being native to Florida. Several species extend to the Cape of Good Hope.

Growing crinums in St. Louis is somewhat a different undertaking than in Florida under sub-tropical conditions. It takes longer to produce a blooming-sized bulb under Missouri growing conditions, and a conservatory or greenhouse is absolutely necessary to grow these plants in the north. Tropical crinums do not require the conditions you might expect, since the temperature may be as low as 50° to 55° F. at night. During the day in my greenhouse the temperature increases to 75° or 80° F. and then proper ventilation is necessary.

The true evergreen types that grow all winter, like *C. amabile*, *C. augustum*, *C. pedunculatum*, and *C. Asiaticum*, must never be allowed to dry out. Also others like *C. kirkii*, *C. erubescens*, *C. sanderianum*, *C. zeylanicum*, *C. fimbriatulum*, *C. scabrum* and some of the hybrids, though they lose their leaves in winter, must receive a certain amount of water to keep in good condition. *C. giganteum* and *C. laurentii*, while not growing in winter, will keep their leaves during that time, and must be given evergreen treatment. In fact, *C. yemense* and *C. abyssinicum* are the only true species, in my recollection, which may be dried out completely during winter. These are grown out of doors during the summer, harvested after the first frost, and stored in the bulb cellar in perfectly dry soil.

The majority of crinums during the winter are given the following treatment. Their pots are set in large sized pans, filled with sand, and watered from below. This gives the best results, since overhead spraying often causes rot in the crown of the bulb. For greater humidity, pans of water are kept on the hot water pipes.

In summer the pots are plunged in soil outside up to the rim, for they demand a plentiful supply of water during their growing period, dislike the sun, and are partial to semi-shade. After crinums grow in pots for several years, nothing but a knotted mass of roots and very little soil is left; then they should be repotted in the next-larger size container. They require good drainage, a loamy soil, and a good portion of dairy fertilizer, with some sand. An addition of crushed charcoal will have a tendency to keep the soil sweet.

Insects do not trouble them until they are brought into the conservatory in the fall, when their worst enemies are thrip and mealy bug. Thrip are controlled by spraying and fumigating with nicotine. A solution of denatured alcohol and water, applied with a brush, eliminates the mealy bug.

The seeds are planted in small pots singly, or six or more in bulb pans. Some crinum seeds germinate in a short time, while others require four months or more. After seeds germinate, the seedlings are grown for about a year in the seed pans or pots and are then shifted to one size larger pot every time they are transplanted, until blooming-sized bulbs are produced. This sometimes takes four years or more under my growing conditions, since transplanting checks their growth to a certain extent.

EVERGREEN TYPES—

1. *C. amabile*—A most showy and beautiful crinum; immense leaves, recurved at the outer extremities, highly impressive. Two to three flower scapes each year. The outside of the expanded flower is purplish crimson, the inside rosy white; 20 to 30 flowers in an umbel, wonderfully fragrant, opening in succession. It can be truthfully said that hardly any plant can compete with a bulb of *C. amabile* in full bloom. Increases slowly by offsets.

2. *C. augustum*—Leaves more obtuse than *C. amabile*. This is decidedly the most colorful species of the whole genus. The flowers are very fragrant, the scape and buds being deep purplish red or claret purple; 12 to 20 flowers in an umbel, crimson purple outside, rosy white inside. A very rare species.

3. *C. pedunculatum*—an Australian species, very rare and difficult to obtain. Flowers deliciously fragrant and of better substance than those of *C. asiaticum*; 20 to 30 in an umbel, white with red stamens. The bulb attains a large size, sometimes weighing as much as thirty pounds. The largest of the genus.

4. *C. asiaticum* var. *sinicum*—Very large and vigorous growing plant. Crosses easily with other species, and has been used frequently for hybridizing purposes. This is the *C. asiaticum* found growing in many Florida gardens. It usually multiplies by splitting in two parts of equal size, and is easily grown in large pots or tubs. Its appearance is decidedly tropical.

5. *C. giganteum*—One of the best late summer and winter bloomers, a good grower and bloomer. If grown in pots with a good rich soil and a plentiful supply of water, never allowing it to dry off, it will give a satisfactory account of itself. The flowers are of good substance, lasting quite a while in perfect condition, very fragrant and expanding as they age. The foliage is also ornamental.

6. *C. laurentii*:—a native of the African Congo, a species very near to *C. giganteum*. Flowers four in an umbel, white. I have grown this for several years, but up to the present time have not flowered it.

NON-EVERGREEN TYPES—

7. *C. americanum*—It grows naturally in marshes, river-swamps and wet places in Florida. Mr. Bosanquet raised one hybrid, so he informed me, which bloomed somewhat like *C. fimbriatulum*, but larger, and the leaves were drooping instead of being upright. The writer has never been able to do anything with this crinum, owing to its peculiar requirements. It multiplies by underground runners or stolons. It simply refuses to grow in pots.

8. *C. Moorei*—This is one of the best and most satisfactory of all crinums for pot culture. In some locations in Florida and some other Southern States it does not do very well when grown in dry sandy soil. It requires a loamy soil heavily enriched with rotten dairy fertilizer, and it should be planted in small pots. It multiplies rapidly by offsets, and sets seeds readily. The seedlings vary somewhat from the parent type, and at times show "white" leaves; these albinos, however, usually die in a short time. It has pale pink flowers. There is also a white variety. A long bulb neck is one of its chief characteristics.

9. *C. Macowanii*—is similar to the above, but has a longer and more slender neck, and the leaves seem to start at one point in a short spiral form. This species has no doubt been confused at times with *C. Moorei*. The latter is variable from seed and this possibly accounts for the differences in the bi-generic hybrid "Amarcrinum" raised by Mr. Howard and "Crinodonna" by Dr. Attilio Ragionieri.

The writer crossed *C. Moorei* x *C. longifolium* (parents of the hybrid *Powellii*) at different times, and succeeded in growing from seedlings which were distinct from the pink and white *C. Powellii* varieties.

10. *C. longifolium*—It is hardy in this latitude with slight protection. It is a wonderful grower and seeder, the seeds germinating where they fall. It is an abundant bloomer, and I have used it a great deal in hybridizing. There are two varieties, pink and white, the latter being by far the better flower. This crinum was used extensively by Herbert and his contemporaries; of the twenty-three hybrid crinums listed in Kunth's "*Enumeratio*" the majority are of *C. longifolium* (*capense*) parentage.

11. *C. scabrum*—This is a very distinct species. The leaves are closely veined; the edge is scabrous and deeply and regularly undulated. The writer has experimented considerably with this species, using *C. scabrum* as seed parent and *C. zeylanicum* as pollen parent as a rule, but some times reversing the process. The foliage of hybrids in the first case resemble *C. scabrum*, while in the second case they resemble *C. zeylanicum*. The flowers are alike, showing no variation.

12. *C. zeylanicum*—This is a beautiful flowering bulb, sold as *C. Kirkii* by many dealers. The pollen used on *C. longifolium* produced a hybrid with foliage resembling the seed parent, and flowers on the order of *C. zeylanicum*, but the stripe on the segments was paler than that of the pollen parent.

13. *C. kirkii*—The flowers are 12 to 15 in number, pure white, with a very distinct broad crimson stripe down the center of the segments. Easily recognized by its short peduncle. Very interesting, and quite distinct from *C. zeylanicum* with which it is frequently confused in dealers' minds. My original bulb was lost, and I have been trying unsuccessfully to replace it. *C. zeylanicum* has been substituted. I have two crinums received under the name of *C. Kirkii*, but until they bloom I cannot be positive as to their identity.

14. *C. yemense*—This is an Arabian species, color white, sometimes pale pink in the bud; sets seed readily, the writer using it with such species as *C. Abyssinicum*, *C. zeylanicum*, *C. scabrum* and *C. Moorei*. The cross with *C. zeylanicum* resulted in two variations of color, the stripe on one of the hybrids being much paler than the other. *C. yemense* crossed with *C. Abyssinicum*, after seedlings attained a fair size, were planted in the open, resulting in a better and stronger growth. They may be taken up in the fall after frost and stored in the bulb cellar in dry soil.

15. *C. Abyssinicum*—This is a species from Ethiopia, with distinct foliage, sub-erect, of a decided blue-green. The flowers are satin-white, very fragrant, and rather a shy seeder. I had quite a supply of this species at one time, but at present my stock is rather low. This also applies to *C. yemense*, both of which seem to be non-existent in this country.

16. *C. erubescens*—This is a native of the American tropics, where it grows in very rich swampy soil. It adapts itself readily to pot culture however. An exquisite species of great beauty and fragrance. There are as many as seven varieties. I have never used this species in hybridizing, since it blooms at a time when other Crinums are not in flower.

17. *C. kunthianum*—A species from Colombia, flowers pure white, very fragrant. A variety *Nicaraguaense*, is more robust, flowers fragrant, of a deep purplish red on the outside, showing a faint rosy stripe in the center of each segment when fully expanded. A good grower and multiplier.

18. *C. pratense*—The name suggests meadow-loving; flowers 6 to 12 in an umbel, pure white. Has never set seed for me, and is a poor bloomer.

19. *C. fimbriatulum*—Near *C. scabrum*; Flowers 3 to 7 in an umbel, fragrant, with a distinct band of red down the center of the petals. The crinum under this name offered by growers is an entirely different species, though it is one of the most beautiful and floriferous of crinums. Does not set seed; the late Henry Nehrling thought it might be a hybrid of Herbert's time.

20. *C. campanulatum*—The bulb is small; leaves deeply channeled, so as to appear cylindrical; four flowered, red, streaked with green, and red near the base, becoming rose colored as it ages. Discovered in shallow grassy ponds in East Cape Colony in Africa. Flowers strongly fragrant. I have never been able to grow this Crinum successfully, due to its peculiar growing conditions. Although they flowered several times, the writer lost all of his bulbs. A very distinct species, and the one offered in the southern states is not the true type, being much larger. I am under the impression that it is *C. latifolium*.

21. *C. sanderianum*—Near *C. scabrum* but smaller in bulb and leaf. Three to four flowers in an umbel, nodding, turning one way, with a conspicuous red keel. A recent addition to my collection, and very distinct.

22. *C. caryanum*—Flowers 6 or more, very fragrant; white, reflexing, stained on the outside near the extremity with red. Hardly any difference between the form of this flower and those of *C. americanum*, it is closely allied to *C. speciosum*, another recent addition to my collection.

23. *C. lineare*—A very handsome plant; flowers white, suffused with different rose shades, sweet-scented, blooms in September. A rare species, and shy bloomer.

24. *C. graciliflorum*—Flowers 6 to 8 in an umbel, reflexing, white. A very distinct plant, of which there are several varieties. Makes a good pot plant, requiring a rich soil.

In conclusion, it might be said that the larger crinums, such as *C. amabile*, *augustum*, *C. pedunculatum* and *C. asiaticum* will not appeal particularly to the amateur gardener unless he is a collector or hybridizer. They are too large in size and hard to manage. The smaller species, hybrids and hardy kinds are preferred by the amateur gardener. *C. Powellii*, for example, is as hardy in this latitude as its parent *C. longifolium*, which survives our winters with protection. The pink form is a poor color and rather a second-rate flower; but the white is very good. By hand pollination of the latter, I obtained one seed, which was planted and nursed with the utmost care. It never germinated.

Those species and hybrids, hardy like *C. Powellii*, or which may be grown like gladioli in the North, planted in the open in spring and dug in the fall, (stored in soil and kept dry during the winter), will undoubtedly become popular. The amateur has no facilities for growing crinums in the window garden for want of space, while conservatories and greenhouses are scarce and expensive to maintain. Many of the species like *C. amabile*, *C. augustum*, *C. kunthianum*, *C. pratense*, *C. fimbriatulum* and *C. lineare* do not set seed. Others like *C. asiaticum*, *C. pedunculatum*, *C. giganteum*, *C. americanum*, *C. erubescens*, *C. Kirkii*, *C. Abyssinicum*, *C. sanderianum*, *C. graciliflorum*, *C. Moorei* and *C. Macowanii* are fairly good seed bearers, and may be used as either seed or pollen parents. The hybridizers' selections of seed parents are naturally confined to these latter species.

So far the writer has not had any success in using the pollen of hybrids in crossing. Often the seeds look promising, but in most cases the pods are empty. *C. longifolium*, on account of its hardiness, profuse blooming habits and wonderful seed-bearing qualities seems to be the logical choice with which to experiment. The writer has on numerous occasions had partial success, and some of the seed would germinate, but the results were disappointing. If hybrid *Crinums* could be used like the hybrid *Hippeastrums*, our labors would not be limited to the species.

DAFFODILS IN KENTUCKY

MRS. WILLIAM LYMAN CARTER, *Kentucky*

Narcissi have been cultivated and loved, wherever man has made a garden. Theophrastus, a very celebrated Greek teacher of botany and philosophy, mentioned Narcissi in his writings about 300 B. C. Mohammed wrote "He that hath two cakes of bread, let him sell one of them for some flowers of Narcissus, for bread is food for the body but Narcissi are food for the soul."

Narcissus, Daffodil and Jonquil—What is the difference? The most popular of all the old herbalists, John Gerard, born in 1545, answered the question as follows,—“Generally all the kinds are comprehended under the name Narcissus, and in English Daffodilly.” While Dr. John Parkinson, who was born in London, England, 1567, during the later part of his life, evidently had grown tired of this age old question being asked of him every spring, and one day he impatiently replied,—“Many idle and ignorant gardeners, do call some of the Daffodils, Narcissus, when all that know any Latin, know that Narcissus is the Latin name, and Daffodil the English of one and the same thing.” Unquestionably the answer is clear enough. Mr. John:

C. Wister of Philadelphia, one of America's greatest authorities on bulbs, in his book "Bulbs for American Gardens" calls them Daffodils.

In the Spring of 1894 seven beds were spaded up, and made ready for my flower garden, although anticipating a "Bundle from Heaven", our first "Blessed Event", and fully realizing the big expense to be incurred, I wondered and pondered how I could buy the Daffodil bulbs, so alluringly beautiful, pictured in John Lewis Child's flower catalogue. The unspeakable joy and satisfaction that the eighteen bulbs, three of a kind, gave me, none but an enthusiast flower lover can realize. That was many years ago. Son reared his son and daughters, in the same little home made box cradle, he crooned and cried in, while I planted my first Daffodilly's! he was a high spirited, mischievous, lovable little lad, many the times, blossoms from these bulbs carried to teacher, or schoolmate, made peace for him; early in life, he learned to "say it with flowers."

Please keep in mind that Americans were highly satisfied with the above mentioned bulbs, along with the many other varieties of that period of daffodil development, and we did not become bulb conscious until a few years before the Government Quarantine, known as No. 27. Suddenly it dawned, all too late on the public in general, what the British and Dutch growers were doing for daffodil flower lovers the world over. It was then, that commercial bulb growing seemed to spring up over night in America. The most important of these firms are located on Long Island, coastal Virginia and the Puget Sound districts.

Quarantine 27 never did alarm or trouble me in the least, and mind you 7 years ago, the time of transferring our home in the city to this country spot, 5 bushels of dried off bulbs, including tulips, hyacinths, fritillarias, crocus, galanthus, scillas, muscari, leucojum, calochortus, camassias, and other kinds were successfully replanted. A peck or more of the older daffodils were naturalized in the grass, in the newly planted, small fruit orchard, and in spite of the heavy sod of blue grass, they have been highly satisfactory.

Always I have made a practice of lifting a plant or bulb as soon as it seems to be going wrong, and long before I ever heard of eelworm, many bulbs with yellowish foliage were dug up and put on the rubbish pile and burned. Perhaps this is the reason there are so few pests in my garden. I have not been afraid of an infestation of foreign pests, which to my mind, has been greatly exaggerated, as some of these pests have been in this country, in many sections the past forty or more years. The fact remains however, that the bulb flies and eelworms are a menace to our bulb gardens, and commercial bulb interest.

My list of the fine kinds of imported hybrid daffodils planted the past ten years, especially the ones planted five years ago in a special bed for new ones, obtained from friends with permits, is as follows,—

Yellow Trumpets—*Van Waverens' Giant, Glory of Leiden, King Alfred, Olympia, Guinea Gold, and Golden Emperor.*

Tall White Trumpets—*Alice Knight, Eskimo, Loveliness, W. P. Milner, White Emperor and Mrs. E. H. Krelage.*

Bicolor Trumpets—*Spring Glory, Weirsdale Perfection, Herod, Glory of Sas-senhein, Victoria, and the lovely pink daffodil, Rosary.*

Incomparablis Yellows—*Homespun, Helois, Princess Mary, Croesus, and Autocrat.*

Bicolor Incomparablis—*Lucifer, Will Scarlet, John Evelyn, and Whitewell.*

Barrii Yellow—*Bonfire, Conspicuous, Diana Kasner, and Bath's Flame.*

Barrii White—*Red Beacon, White Star, Miss Willmott, Sea Gull, Firetail, and Hera.*

The Giant Leedsii—*Her Grace, Puritan Maiden, Lord Kitchener, Laughing Waters, and White Lady.*

Poets—*Ornatus, Recurvus, Horace, Dactyl, and Edwina.*

The Poetaz—*Laurens Koster, Dante, Klondyke, Elvira, and Helois.*

Double Daffodil—*Primrose and Orange Phoenix; Alba Plena Odoratus, sweet scented, and never fails to bloom in my garden.*

Jonquils,—*Orange Queen, Campernelle, both double and single varieties, and the lovely Buttercup.*

Growing in the rock garden are Triandus Hybrids—*Viscount Northcliffe, Queen of Spain, and Mrs. J. M. Franklin.*

Species—*Gracilis*, *Minimus* which grows as high as five and six inches; *Cyclcamieus* is a good doer and fine bloomer, increases fast for me.

Bulbocodium citrinus, *B. conspicuus* and *B. monophyllus* are impossible to grow in my garden, owing to the lime in the soil I think. Sixteen years ago I tried the old "Hoop-Petticoat," *B. citrinus*. All twelve of the bulbs bloomed the first year, oddly attractive. The next year only four of the bulbs appeared above ground, with no blooms, and I never saw them afterwards. Four years ago I planted all three kinds; all have "passed out," too much lime in our soil, I think. With the exception of these, every one, and more that I have not mentioned, grow, bloom and increase rapidly. It is such a joy to surprise some good friend, with a gift of a dozen tall growing, glorious blooming daffodil bulbs from my own garden.

LYCORIS RADIATA

W. M. JAMES, *California*

This is a native of Japan and China. The bright red funnel shaped flowers have wavy segments, resemble nerine flowers somewhat and appear in the fall before the leaves. It is free blooming and easily grown.

It will do well in any soil and should be covered only to the neck when planted. The leaves grow all winter and will not stand much frost. It should have a dry rest period during the summer and makes fine clumps if left undisturbed for several years.

I have examined several plantings and am quite sure that nearly all the stock in this country being sold as *Nerine sarniensis* is really *Lycoris radiata*. The leaves of all the lycoris have a very definite keel. None of the leaves of some 15 nerines I have examined show any indication of a keel. Leaves of *N. sarniensis* from seed imported from South Africa resemble the other nerine leaves and do not resemble the leaves of the plant being sold as *N. sarniensis*. The petals of the flowers of the true *N. sarniensis* are more reflexed than are those of *L. radiata*, and the latter splits and increases much faster than most of the nerines. The nerines split very little and increase mostly by offsets. The only thing I have not checked are the seeds. True *N. sarniensis* seeds are green colored, while those of *L. radiata* are black. I will be very glad to cooperate with any one who wishes to check this further. Both plants are desirable, but *L. radiata* propagates much faster than *N. sarniensis* and should be in a different price range.

In four species of *Lycoris* which I have, the dry, outer covering is dark brown, very thin and breaks readily, either horizontally or vertically. The nerine species and hybrids which I am growing have a very different outer covering. It is light brown to white in color, much thicker than that of the lycoris and has fine, tough cotton-like fibres. These fibres are also in the live scales and are so tough that they often push through a bulb ahead of a sharp knife when the bulb is cut in half. All of the dormant bulbs I have seen of the so-called *Nerine sarniensis* on the market at present resembled the bulbs of the other species of *Lycoris* which I have and showed none of the fibres which seem to be so characteristic of the nerines.

NERINE SARNIENSIS AND LYCORIS RADIATA

WYNDHAM HAYWARD, *Florida*

An apparent confusion of plant nomenclature in regard to bulbs of *Nerine sarniensis*, a popular fall-blooming item much grown in greenhouses in the north and in Southern gardens in the United States has been revealed by preliminary investigation. The studies to date indicate that thousands of bulbs in the trade and in private culture passing as *Nerine sarniensis* are actually *Lycoris radiata*.

Nerine sarniensis is a South African member of the Amaryllis Family, while *Lycoris radiata*, which is somewhat similar in habit and flower, comes from Japan. Careful comparison of flowers of the supposed *Nerine sarniensis* blooming in Florida, with the original illustrations of this species and that of *Lycoris radiata* leaves no doubt but that the bulbs are truly the *Lycoris*, and are masquerading under a wrong identity. A further report on this subject will be made at a later date. Mr. W. M. James of California also reports his suspicions of the error.

THE CULTURE OF LYCORIS AUREA

JOHN R. HEIST, *Florida*

Just how *Lycoris aurea* found its way to St. Augustine gardens will probably always be in doubt. However, there can be no doubt that it found conditions much to its liking.

It has very distinctive habits and reverses the usual order of things, flowering in late summer and early fall, making its growth and increase in winter, losing its foliage with the first warm weather of spring and remaining entirely dormant during the hot rainy summer months.

Lycoris aurea thrives in our sandy loam like a native, flowering equally well in full sun or shade but making much more handsome foliage when grown in shade. Because it dislikes being transplanted it is usually seen naturalized in borders where the clumps increase in size annually. Old clumps produce up to a dozen or more bloom stalks and make an impressive sight.

Generally speaking the *Lycoris aurea* found in St. Augustine are not cultivated and fertilized regularly as are other bulbs and garden flowers but are left to more or less shift for themselves. This they are perfectly capable of doing for they are found and thrive in the door yards of the modest homes as well as in the well ordered gardens.

The writer growing *Lycoris aurea* for increase uses bone meal liberally when planting during the dormant period and gives the beds a top dressing of dairy fertilizer when the foliage appears in the fall. Clumps are divided every third year. They make their foliage and growth in the coldest months and it is necessary that the foliage matures to insure production of bloom. They have however proven more hardy than most amaryllids. In the December 1934 cold spell they went through a temperature of 24 degrees with foliage unharmed and the following September bloomed profusely.

CYRTANTHUS AND HAEMANTHUS IN NATAL, SOUTH AFRICA

MRS. J. W. ARCHBELL, *Natal, Union of South Africa*

In our favoured climate, where the winter is the most delightful season of the year, and the coast of Natal is the playground for the rest of South Africa, there is very little change in the weather when spring comes, but the plants feel it sooner than we dull human beings. Thus some of the bulbous plants serve as harbingers of spring.

In Miss Mary Ritchie's delightful little book, "The Drama of the Year", the various South African amaryllids are described as they flower; each in its order, month after month, beginning in the early spring (August), with the dainty *Cyrtanthus McKenii*, the Ifafa Lily, and ending in the autumn and winter with the aloes, some of which are as small and dainty as any *Cyrtanthus* while others are giant varieties 6 to 10 ft. high.

From Miss Ritchie's interesting articles in one of our newspapers, we secure information about our South African plants. Particularly interesting are the *Cyrtanthus*, surely among the most fairy-like members of the large Amaryllis Family. The white species was found by Mr. McKen, the first Curator of the Natal Botanic



Miss K. C. Stanford

Cyrtanthus sanguineus

Gardens, Durban, in 1869, on the shady banks of the rivers in the Ifafa district. He sent the bulbs to Kew Gardens, where they were described by the famous botanist, Joseph Hooker, and named *Cyrtanthus McKenii*. *Cyrtanthus* species in various colors were found in other districts in Natal. There is *C. O'Brieni*, a brilliant red; *C. interscens*, deep yellow, and a charming peach-blossom pink. There are also many pretty hybrids. All flower in August and September, and some again in July. They have narrow dark green foliage, and the tubular flowers are borne pendant on the umbel. The number range from 6 to 9 or 12 to the umbel, and they have a pleasant odor.

Cyrtanthus angustifolius, or the Fire Lily, springs up after the grass fires in August. They are a striking sight on the black hills, as the flowers are much larger than the Ifafa Lily, and are of a clear red, carried on 12 inch stems. Many gardeners have attempted to cultivate them, but with little or no success. In the uplands of Natal there is a yellow variety.

A little later, usually in October, *C. obliquus* flowers. It is very handsome, having broad strap leaves, and 6 to 8 large flowers, red with wide green tips. The flowers are borne on 18 inch stems.

In December and January, sometimes as late as February and March, the Inanda Lily, *C. sanguineus*, comes to gladden our eyes. It is the most beautiful of all the *Cyrtanthus* group. The exquisite colour of the flowers has been compared to the brilliance of the sunrise. They are larger than those of the Ifafa Lily, and the tube is shorter and more open. The shape is almost that of the hybrid amaryllis. There are from 1 to 2, at most 4 flowers on the slender stem. It was interesting to read in the article on Amaryllidaceae in Kenya Colony in the 1935 Year Book that this species is also native there. In Natal it responds well to cultivation and flowers freely. *C. Calpeni* is very much like it, but more delicate and fragile.

There are said to be many species of *Haemanthus* in South Africa. The best known in Natal are *H. natalensis* and *H. Katherinae*. The former is one of the "Heralds of Spring". It is called the Snake Lily, for no apparent reason. It forms a very handsome head of red and yellow flowers of rather still brush-like form. This shoots up before the fresh leaves, and later on the scarlet fruits are also very striking. I read with interest in the 1935 Year Book about *H. multiflorus* in Kenya Colony, and appreciated the striking picture of it as grown in Florida in the United States of America. It resembles the Natal *Haemanthus Katherinae*. The bulbs of the latter go partly dormant in our winter (June and July), and then about August, the leaves shoot up. They develop gradually by mid-summer into a fine plant, almost like a small banana clump. Often there are six handsome leaves. In December or January, one of the most beautiful South African lilies shows itself on strong 30 inch stems above the green leaves. First the white bracts are conspicuous like a snow-ball, then they gradually wither back. The flowers grow quickly and before long there is a great glowing ball, more coral red than scarlet which is quite a foot in diameter. The sight is long-to-be-remembered when seen in the deep shade of the forest where they thrive best.

NERINE FILIFOLIA

W. M. JAMES, *California*

This *Nerine* species is a real find for gardens in milder climates. The thread-like leaves are evergreen, 6 to 8 inches tall and are a pretty shade of light green. The dark pink flowers are widely funnel shaped with narrow wavy segments slightly reflexed near the tip and the pistils and stamens longer than the segments. It blooms in the fall with 6 to 10 flowers in an umbel on wiry stems 12 to 15 inches tall and is very good for cutting.

It seems to be indifferent as to culture. Bulbs which were watered once last summer flowered about the same time and as well as those which were planted by the edge of a lawn and were watered once or twice a week all summer. However the foliage on those by the lawn was much better than that of the others. The bulbs are small and soon make nice clumps, and when planted should be covered

only to the neck. I have moved them every month in the year, but have not been able to pick out which bulbs are certain to flower. It apparently does best after it is established and should be left undisturbed as long as possible.

CULTURE OF SNOWDROPS (*GALANTHUS NIVALIS*)

MISS MARY E. DAVIS, *Rhode Island*

In Southern New England, the snowdrop is the earliest appearing flower, one variety showing its first blooms in January, often lifting its head above the snow if this is not too deep.

The buds appear first, but the two long leaves may be picked at the same time with the opening flower. The plant grows from three to six inches high and thrives in any good garden soil. The Snowdrop seems to prefer locations facing the South.

We have had snowdrops bloom year after year without disturbing the bulbs, but it is said that it is best to divide clumps after three years, or whenever they seem to become crowded. We plant the bulbs in late October, that some root growth may be made and the bulbs become established before winter.

ZEPHYRANTHES IN FLORIDA

E. L. BRASOL, *Florida*

If the North can boast of its Lilies of the Valley and Crocus, the South may be equally proud of the Zephyr Lily, one of the loveliest little flowers to have around the home in a porch box, in the rockery, along the walk, or massed in a favorite corner in the garden.

Both the native species and the imported kinds are hardy, do not require any care or special attention for years after being planted. When left to themselves they will bloom when their time comes and will then delight the grower.

Two varieties are more commonly grown here, the large flowered pink *Carinata* and the white *Candida*. Rather rare is the large flowered *Robusta*. They all bloom after a rainy spell, hence the popular name—Rain Lilies.

The quite rare and lovely yellow *Citrina* behaves in the same manner and therefore is very welcome. Some years ago two bulbs of this variety were found by the author of this article in a long neglected garden. These are now propagated for general use.

The two native varieties, the delightfully sweet-scented *Atamasco* and *Treatiae* grow on low acid soils of the flatwoods. Unless planted in acid soil they will not bloom under cultural conditions.

Zephyranthes do better under direct rays of the sun, but will bloom well in semi-shade and even in shady locations, thus being of double value for landscape arrangements.

In general *Zephyranthes* are little known as yet, for most of them are still rare. However, they are rapidly becoming more popular and no Southern garden, or Northern window garden or conservatory is complete without them.

AMARYLLIS AS A HOBBY

J. B. PETTIT, *Ontario, Canada*

Some thirty years ago when passing a seed store in one of our large Canadian cities, an excellent specimen of *Hippeastrum Johnsoni* was noticed as part of the window decoration. This was a well grown plant with two tall spikes, each bearing four large flowers or buds. The flowers on one spike were about at their prime and one bud on the other spike just opening with the others ready. While this specimen was not supposed to be for sale it at once came into my possession along with some large dormant bulbs. I listened attentively to growing instructions given by the clerk and have found in the years that have passed that he knew what he was talking about. This was my first experience with the amaryllids. I have been working with them ever since.

In Canada the amaryllis is not grown to any great extent. There are different reasons for this. When we consider climatic conditions prevailing we at once understand that all specimens must be grown indoors. They cannot be cultivated in the garden or field here as in some sections of the United States. In the window garden, I have heard it contended that the amaryllis takes too much space and—"if they ever bloom"—the flowers last but a few days, and consequently isn't worth while. However, I believe the main reason the amaryllis is so seldom seen is that so few people seem to get them to bloom the second time. Most people make one of the two prevalent errors. When blooming is past, either the pot is set aside and the plant given little or no attention, or the other extreme is followed and the plant kept growing continuously with no rest period allowed. Those who have had any degree of success with amaryllis know what either course means.

It is next to impossible to get any choice named sorts in seed and bulb stores in Canada. The general run of seedlings in commerce is quite inferior. About ten years ago I procured some seeds from the United States from which some very good seedlings have come. Nothing to rave about, however. There are some good colors and shapes and from 6" to 7" in diameter. Some bulblets were also secured which gave splendid colors and 8" to 10" diameter blooms.

A neighbor, who has a small greenhouse and nursery, five years ago imported 100 mixed seedlings from a bulb grower in Holland. I saw many of these when in bloom and a great percentage were very fine indeed.

During the past year I had the pleasure of visiting the Ontario College of Agriculture at Guelph, Ontario, where the amaryllis collection was in bloom. There were from 40 to 50 seedlings in bloom, but on the whole I considered them quite inferior. Not a single outstanding specimen was noticed. These were grown from supposedly choice seed.

One gets great pleasure from working with this flower and watching the development from the time the bud pokes its nose from the bulb to the perfect open bloom. And then one has something not seen in every window garden.

AMARYLLIDS IN PENNSYLVANIA

JOHN F. RUCKMAN, *Pennsylvania*

Too little is known about the northern range of hardiness of many tropical and subtropical plants and under what special conditions they can be grown beyond their normal range. For several years I have been experimenting with doubtfully hardy material and in many cases the results have been most gratifying. Given certain situations and certain methods of planting many tender plants can be grown in colder regions than is generally supposed.

Here, thirty miles north of Philadelphia, our climate is about half way between that of New York and Philadelphia—we are beyond the often mentioned "hardy to Philadelphia" zone. Mostly 5° F. or 6° F. or possibly zero F. is as cold as we get,

but the last three winters have been unusually severe with 12° F. below zero and a week of sub zero weather this past winter and 19° F. below in the winter of 1933-34. Many supposedly hardy perennials and shrubs were badly damaged or killed outright but four amaryllids came through unscathed.

Amaryllis belladonna, in the "hardy to Philadelphia" class, was planted at the foot of a south-facing six foot retaining wall not far from a spring which may have had some slight warming influence on the soil. It was planted deep with the neck of the bulb about an inch below the surface. The hole was dug some two inches deeper than was necessary to accommodate the bulb. In the bottom was put an inch of well aged poultry fertilizer and then an inch of sharp sand and the bulb set on this. In filling the hole sand was poured in around the bulb so that nothing but sand touched it at any point—it had at least an inch of sand around it in all directions. This I consider rather important in the case of tender bulbs in cold climates; kept reasonably dry they will tolerate much lower temperatures. The blanket of sand keeps the fall rains from starting the bulb into a premature growth, thus prolonging its period of dormancy through the cold weather. The roots strike down through the sand for needed moisture but rotting of the bulb by contact with the damp earth while not in active growth is prevented. When the ground freezes in November *Amaryllis belladonna* is covered first with two inches of fine grass stiff enough not to mat, and then with four inches of leaves. This particular bulb sulked for a full year after planting. Set out in March it showed no sign of life, leaf nor bloom till the following March when the foliage thrust up through its mulch.

That *Lycoris squamigera* should prove hardy was perhaps not so surprising as its extreme willingness to grow and bloom. Set out in March in the same location as *Amaryllis belladonna* and in exactly the same manner it sent up foliage within a few weeks and bloomed on schedule in August. The following spring it started to multiply.

Crinum capense rosea was planted at the base of a five foot south east facing retaining wall. It also was set in sand but was not planted as deeply as the others, some two inches of the neck of the bulb being above ground. As there was considerable undamaged foliage on it even after the ground froze, eight inch boards were stood on edge forming a box around it; this was filled with half and half grass and leaves. Such foliage as protruded above the covering was of course frozen back but new leaves started growing in the middle of March and have not been harmed by several heavy frosts since then.

Habranthus planted last May is only now, a year later, showing its first sign of life—a sparse reluctant looking foliage. However, bulbs of the same lot potted up and kept watered in the house all winter started their first foliage only a week or so ahead of those left in the open ground. Apparently it resents transplanting but the bulb at least would seem to be quite well able to endure low temperatures. Just how it will do in the long run remains to be seen as I understand it normally sends up foliage in the fall which stays green all winter; that would be quite an accomplishment in this climate though I have known *Triteleia Coerulea* to do it.

In the spring of 1932 I planted a packet of mixed *Alstroemeria* seed in an open ground seed bed. As they showed no sign of germination by late fall of that year they were given up as a total loss and iris seed sown on top of them. I did not know then, as I have since learned, that *Alstroemeria* seed germinates much better fall planted and allowed to freeze in the ground. But in the spring of 1933, a year after sowing, one strange seedling came up among the irises. Never having seen an *Alstroemeria* I could not be sure of its identity but I had my suspicions. It was left with the iris seedlings and came through the 19° below zero of the winter of 1933-34 with no protection but two inches of dry grass. Through the summer of 1934 the plant was a poor affair of two weedy stalks and was nearly discarded more than once. But in the spring of 1935 it came up as a fine clump of six or eight vigorous stalks and bloomed in June confirming at last my suspicion that it might be an *Alstroemeria*. Having come from a packet of mixed seed I do not know the species; probably it is *A. aurantiaca flava*. It bloomed eighteen inches high with three to five up-facing two inch cadmium yellow lilies on each stalk; some were plain yellow and some very lightly spotted with brown. It was in continuous bloom for six weeks and was a gorgeous sight. As I wanted it to set seed—which it did freely—I left it in the seed bed all summer and, having little faith in fall planting, left it there until this spring.

It came through another hard winter with the same slight grass protection. When I transplanted it into the garden recently the clump was fully three feet in diameter, twice as large as it was last year. The seed bed where it has grown is anything but a protected spot. Far from the warmth of retaining walls or spring it is on the north side of a clump of shrubbery and is swept by north and west winds. The soil is plain field soil, unenriched and with no special provision made for drainage. That this particular *Alstroemeria* has done so well there through two such severe winters with such meagre protection would seem to prove that it at least is reasonably hardy in this latitude. Certainly it is a very choice thing and worth much more care than it seems to demand.

Zephyranthes carinata has survived mild winters in the open but as it performs so well and is so easily handled given gladiolus treatment or grown in large pots that I never leave it out intentionally. *Cooperia pedunculata* and *Zephyranthes Ajax* bloom all summer here and set seeds freely, the former with gladiolus treatment, the latter in pots. *Z. carinata* occasionally sets seed grown in pots in semi-shade. *Z. texana*, *Z. atamasco*, *Z. rosea*, and *Z. candida* however, do not seem altogether happy, blooming sparingly if at all. I think possibly the outdoor growing season, from May 1 to October 15 approximately, may be too short for them and I have no facilities for keeping many of them growing inside. *Sprekelia*, *Childanthus* and such *Hymenocallis* and *Pancratiums* as I have tried have been very reluctant. However in their case I think the fault was mine for I have seen beautifully grown specimens of *Sprekelia* and *Ismene calathina* in this region and hope eventually to succeed with them.

Of the amaryllids treated exclusively as pot plants *Clivia miniata* does beautifully and strangely enough *Agapanthus* does not, but here again I think the fault is mine. *Vallota purpurea*, one of the handsomest of all the amaryllids, is easily handled and should be much more grown. *Eucharis* and *Nerine sarniensis* seem to grow nicely but as yet my bulbs are too young to bloom. The nerine's habit of winter growth and summer dormancy is rather troublesome in this climate unless one has a greenhouse.

I keep *Hippeastrum Johnsoni*, *H. equestre* and hybrid *Amaryllis* evergreen, resting them from four to six weeks in the fall in a light cellar but water them enough to keep the foliage in good condition; they are so much handsomer bloomed with foliage. They are given manure water once a week from December until mid-April and kept very pot-bound. I never repot until they seem in danger of breaking the pot or heaving themselves out. One clump of *H. equestre* bloomed happily for thirty years without repotting. When the weather has settled they are set outdoors in half shade and mulched with manure or hoof shavings are put in the bottom of the pot and the bulb slipped back without disturbing the soil or roots. With this treatment many bulbs both of *H. equestre* and the hybrids bloom twice a year, in early spring and again in midsummer. The summer blooming is usually somewhat lighter, never but one stalk to a bulb though the same bulb will bear two stalks at its winter blooming. This might be thought to weaken the bulb but I can not see that it does; my bulbs constantly increase in size and in number of blooms. Possibly the rather heavy feeding compensates for this, though it is just as well to omit the summer feeding for *H. equestre*.

GARDEN COMPOSTS¹

The Gardeners' Chronicle (London, May 2, 1936) says editorially: "... Messrs. W. J. C. Lawrence and J. Newell have been putting the problem of potting soils to a careful thorough-going test and have discovered that even the methods used by the best of gardeners are susceptible of very great improvement . . . The perfect compost must evidently be free from pests and diseases which attack young plants. The ordinary ingredients used in making composts are not. Therefore they must be made free from pests and plant parasites by sterilisation. Sterilisation—partial sterilisation—of soil is easy enough . . . But may not partial sterilisation damage the ingredients? Loam, leaf mould or moss peat and sand together, it may be with bal-

¹Daily Digest, Off. of Inf., U. S. Dept. Agric., LXI, May 25, 1936.

last for drainage, are the ordinary components of a compost. Do they affect one another adversely as a result of changes brought about by sterilisation at 212 degrees F.? They do. Therefore, it must be good practice to sterilise the ingredients separately . . . The perfect compost should contain enough of all the essential plant foods that roots need if growth is to be satisfactory . . . Partial sterilisation of soil is stated to let loose locked-up stores of nitrogen . . . Experiments described recently in these pages show that the chief deficiency in composts is phosphoric acid . . . The quantity required to make seedlings go on growing in the compost without check is very small, say, three-quarters of an ounce of superphosphate to a bushel of soil and sulphate of potash at the rate of three-quarters of an ounce to the bushel . . . It is a fine piece of work, this enquiry into the perfect compost, and will lead to further and much needed investigations into the fertility of the garden and its soils."

BULB EXPERIMENTS AT KIRTON AGRICULTURAL INSTITUTE¹

"Interesting experiments in connection with bulbs are again being carried out at Kirton Agricultural Institute (England) this season," reports Gardening (London, April 18). "The cultivation experiments include hyacinth propagation; effect of growing stocks from 'mother' bulbs versus small offsets narcissus; cutting versus non-cutting narcissus and tulips for market and the effect on bulbs when forced; effect of weeds on bulb production; conditions of storage and effect of temperature. In addition, the R. H. S. trials of varieties of narcissus are open for inspection, together with trials of 200 newer varieties of narcissus. The latter demonstration was established at Kirton in 1934-35 season. Manurial experiments are also carried out and experiments on the control of disease are included."

CULTURE OF AMARYLLIDS

I. W. HEATON, *Florida*

The past year has definitely shown the need of some changes in standard amaryllis culture. The advantages of some form of shade have been proven conclusively. In fertilizers Milorganite has proven a valuable source of both Nitrogen and Bacteria. Market conditions have forced the adoption of the Dutch bed method of cultivation in order to reduce production costs, as it is not possible to grow Amaryllis in the open field at a profit under present market prices.

This change has naturally necessitated further changes in soil management as cover crops cannot be grown in conjunction with bed culture and shade. To offset loss of humus from cover crops, dairy fertilizer and local peat have been extensively used. Closer planting under the bed method has necessitated the need of incorporating greater amounts of plant food both in the form of humus and organic fertilizer materials.

The average cost of producing hybrid amaryllis under the Dutch bed method for 13,000 bulbs is as follows,—

Lumber, 350 bd. ft.	\$14.00
Labor, 2 men, 1 day @ \$1.50	3.00
Manure, 6 cu. yds.	6.00
Muck, 6 cu. yds.	6.00
Fertilizers:	
Hardwood Ashes 200 lbs.)	
Lime 400 lbs.)	
Goat Manure 400 lbs.)	
Tankage 200 lbs.)	21.00
Tobacco 200 lbs.)	
Bone 200 lbs.)	

¹Daily Digest, Off. of Inf., U. S. Dept. Agric. LXI, May 8, 1936.

Labor working in material and final grading	3.00
Planting	9.00
Cultivating 10 times	7.50
Two additional applications of mixed Fertilizer, 200 lbs.	7.20
Total	<u>\$76.70</u>

The cost on a one year basis \$5.90 per M. Production when planted to 2½" stock is as follows: 9,100, 2½-3" ; 2,600, 3-3½" ; and 1,300 culls.



I. W. Heaton

Heaton shaded propagation house

Vegetative propagations on two benches to right; seedlings on two benches to left.

If seedlings are planted these additional items must be added to the first years cost of \$5.90,—

Cultivation 10 times	\$ 7.50
Three applications of 200 lbs. each	9.80
	<u>\$17.30</u>

This makes an additional charge of \$1.32 per M. or a total of \$7.22 per M. for two years with a production of 4,290, 3" ; 6,500, 2½" ; and 2,210 culls.

Placing these figures on an acre basis and including the cost of one acre of shade the total is \$1,372.00 against a production of 75,000, 3" and 84,000, 2½" bulbs, at an average cost of \$8.00 per M. for marketable sizes. These figures do not include taxes or interest on miscellaneous items.

The following table roughly outlines the best growing conditions for amaryllids in Florida.

Table 1. Indicating requirements for amaryllids in Florida.

Species	Soil Type				pH	Shade	Dormant Period
	Heavy Muck	Medium Muck	Heavy Sand	Sand			
Agapanthus	yes	yes	no	no	5-7	yes	evergreen
Amarcrinum	yes	yes	no	no	6-7	yes	evergreen
Hybrid amaryllis	no	yes	yes	no	6-7	yes	Aug. to Feb.
Clivia	no	yes	yes	no	5-7	yes*	evergreen
Crinum	yes	yes	yes	no	4.5-6	yes*	Winter
Eucharis	no	yes	yes	no	6-7	yes*	evergreen
Equestre, single	no	no	yes	yes	4.5-6	yes	Aug. to Feb.
Equestre, double	no	no	yes	no	7-8	yes	Aug. to Feb.
Haemanthus	no	no	yes	no	6-7	yes	Oct. to May**
Habranthus	no	no	yes	no	6-7	yes	Feb. to Sept.
Lycoris aurea	no	yes	yes	no	7-8	yes	May to Sept.**
Lycoris squamigera	no	yes	yes	no	6-7	yes	May to Aug.**
Nerines	no	no	yes	yes	6-7	yes	May to Oct.**
Sprekelia	no	yes	yes	no	6-7	yes	Oct. to May**
Zephyranthes	yes	yes	yes	no	4.5-6	yes	Varies with species.
Ismene	no	no	yes	no	6-7	yes	Oct. to May**

***Clivia** and **Eucharis** require complete shade. **Crinum Moorei** requires some shade. All of the others appreciate some shade.
**Species marked with a double star in the dormant period column must have very good drainage or be dug and stored during this period.

William Lanier Hunt



A sea of Atamasco Lilies



Carl H. Krippendorfer
The Awakening of Spring; Narcissi naturalized in Ohio Woodland

HARDINESS AND LANDSCAPE VALUE OF THE AMARYLLIDS IN THE NORTH AND THE UPPER SOUTH*

WILLIAM LANIER HUNT, F. R. H. S., *Chapel Hill, N. C.*

Gardeners everywhere, are becoming increasingly interested in the Amaryllidaceae because of the colorfulness, character and interesting habits of the plants included under the genera in this family. Their extreme showiness, owing to their brilliant color, attractive form and habits, and the unusual shapes of the flowers in certain genera arouse the interest of the plant lover. The fact that many of them bloom in late summer and early fall, at a time when there is something of a dearth of flowers commends them immediately to landscape and garden use. More and more of them are coming to be found winter hardy, and with the increasing knowledge of how to handle them in the colder states, there is a greater incentive to raise them there. At the same time, their liking for the drought and long, hot summers of the Southern States recommends them particularly to these regions.

The name *Amaryllis* immediately suggests brilliant color to the mind. While all the genera in this family do not have flowers which are quite as brilliant as certain *amaryllis* or *Hippeastrums*, few of them are drab or lacking in showiness. The colors run the whole gamut of red, copper, orange, fulvous red, crimson, scarlet, pink, yellow and white. Blues and lavenders are not so plentiful but are present in four genera: *Tecophilaea*, *Ixiolirion*, *Griffinia* and in the new *Zephyranthes caerulea*. As the result of the work of hybridists, we can expect many shades and tints of this whole range of color before long.

The shape of the plants, among the larger genera of amaryllids, is somewhat odd to dwellers in the temperate zone, because it is quite at variance with the majority of our native plants with their superabundance of leaves. This very oddness makes these plants useful as accents, for wide, strap-like foliage and bells of flamboyant flowers held on the sturdiest of stems, as in the *Hippeastrums*, is bound to attract attention. The small amount of foliage on a plant with such a show of flowers is also calculated to catch the eye. Then, to go to the extreme in both directions, the tremendous size of the leaves and comparatively small flowers in *Crinum* and the total lack of any leaves at all at the time of flowering in *Lycoris* are phenomena one cannot overlook. All of these habits add interest to plants in the landscape.

Where color or shape of the plant does not get the eye, some other distinctive trait or habit seems to be present to do the work. The fragile and ephemeral little *Zephyranthes* are not large enough to be very showy in a single flower, but they surely make up for it in the numbers that grow and flower together at the same time. This is a pointer from nature which we should not overlook in using these small bulbs, for they simply cannot be at their best in lots of three and four, stuck around in gardens. Even *Agave virginica* is able to assert itself by its odd appearance in a land of mostly non-succulents. This, by the way, is one of the most refined little succulents one can own.

In *Hymenocallis* and *Sprekelia* we have good examples of the unusual shapes to be found among the flowers in the Amaryllidaceae. Incidentally, *Sprekelia* seems to be coming into popularity somewhat as a pot plant these days. Nerines combine both color and shape for their beauty. They have the very interesting habit of coming up out of "nowhere" and blooming all of a sudden. Perhaps no other habit or trait is more creative of human interest than this popping into bloom without the least warning so typical of many amaryllids.

The liking of many amaryllids for the drought and hot summer in the South is a point in their favor which cannot be overemphasized. Any plant which will put up with these conditions is a boon to gardening in a locality where it is well-nigh impossible to do a lot of watering through the summer and where most gardeners go to the mountains or the beach and leave things to dry up until fall. Fortu-

*Mr. Hunt, who is working on the hardiness of amaryllids and other plants, will be interested to receive any information on amaryllids which have proven hardy in the Northern States and the upper South.

nately, the climate in the South is enough like that at the Cape for these bulbs to like it. When Southern gardeners have caught on to the ease with which they may grow them, there ought to be a tremendous interest in all the various genera. It is high time that the people in the South take the hint from the successful way in which *Nerines*, *Sternbergias* and the like grow in their States and give more of the Cape flora a trial here, instead of wasting their time and money on things recommended in Northern literature which are definitely and very apparently unsuited to Southern heat.

In discussing the landscape value of as large a family as the *Amaryllidaceae* over an area as large as that of almost half the United States, for practical purposes one must necessarily consider the point of winter hardiness. The amaryllids are a joy where they can be grown in the open, and everyone should seek to cultivate them outside, wherever it is possible.

FOR THE NORTHERN STATES

In the States above Washington, D. C., of course, the genera *Narcissus*, *Leucojum* and *Galanthus* are well known, much in use and, with the exception of a few species, winter hardy. One is glad to see, too, that *Lycoris squamigera* is coming to be better known and that gardeners are more willing to pay the usual price of a dollar a bulb for this most worthwhile summer bloomer. Reports coming in from New York, New Jersey and other places in the Northern States indicates that *Zephyranthes atamasco*, collected in the middle and upper South, are being grown successfully and with no losses owing to cold there. Some gardeners have succeeded with *Sternbergia lutea* around New York City, and *Nerine sarniensis* has been successfully grown by at least one gardener in the New England States. In addition to these species, there is *Hypoxis hirsuta*, native from Maine to Florida, and *Agave virginica*, native from Maryland south, seems to be able to withstand a lot of cold. The writer has not had the opportunity to check on the hardiness of *Hymenocallis galvestonensis* which Bailey says was introduced as hardy all over the United States, but several other *Hymenocallis* are hardy.

If Northern gardeners were aware of the splendid results which a few pioneers, there, are getting with the tender and "borderline" amaryllids grown in pots and set into the garden to blossom, or grown in the open and stored like gladioli they would undoubtedly try their luck with them. Elsewhere, in the Year Book of the Society, instructions for this kind of culture have been given. To these instructions the writer would like to add from his personal experience the suggestion that Northern gardeners try out a method of planting amaryllis and other tender bulbs which has been highly successful for him in raising subjects not supposed to be hardy even in the upper South. Beds are used which are a foot or more above the surrounding surface of the ground. In preparing such beds, the original surface is thoroughly worked, and then the extra one to one and a half feet of soil is simply added to the top. In this location, drainage is perfect throughout the winter, and the results are quite surprising.

In considering the suitability of amaryllids to a given climate, one must take into account more than mere hardiness of the bulbs to cold. All the species which have winter foliage must be protected somewhat, so that the leaves can have the benefit of the sun. The chief reason for the success of *Lycoris* in the North probably lies in the fact that the foliage does not appear until Spring, when snows and cold are passed. By the same token, *Habranthus miniatus*, hardy in the upper South, should be tried out in the Northern States, for if the leaves are killed in winter, this plant will send up a new crop to ripen the bulbs in spring. Another thing in favor of its hardiness, there, is the fact that the long-necked bulbs, unlike most amaryllis, must be planted deeply—six inches, and would probably escape freezing in protected places. Even *Placea*, supposed to be quite a tender bulb, might turn out to be hardy, since its bulbs are said to occur at great depths in its home in the high mountains of Chile.

William Lanier Hunt

*The unusual shape of *Hymenocallis* flowers is sure to attract the eye*





William Lanier Hunt

Frost-proof, golden sternbergias carry their color well into November

FOR THE UPPER SOUTH

For the temperate states from Washington, D. C. to Florida and west to the Mississippi, the number of genera which we are finding to be hardy is growing rapidly. To gardeners in this section, the amaryllids offer one of the most remarkable groups of all the flowers available. Many a fine plant has never even been tried out in the Middle Atlantic States because of the lack of any but Northern advice on gardening. The word "tender" has too often frightened people away from bulbs which are entirely hardy, even in the colder, mountain sections of these states. Where *gladioli* and dahlias live in the ground with no protection over winter and with only an occasional loss, there is every reason to try out these "border-line" things.

FALL

Possibly the most valuable and interesting group of amaryllids in the Mid-South is the Fall-blooming group composed of *Hippeastrum advenum*, *Nerine sarniensis* and *Sternbergia lutea*. Nothing at this time of the year gives more color or a more startling performance than the flowers from these bulbs which come up out of the ground and bloom where three or four days before, not a thing was visible.

Hippeastrum advenum, the "Oxblood Lily" is, of course, new to gardeners, but one can safely vouch for its beauty and ease of culture in the South. To those who have the feeling that the larger *Hippeastrums* are somewhat too big or even coarse, these little flowers will be a charming surprise. The real ox-blood hue of their little bells is a thing seldom found in flowers and most useful in the garden. The dark, shiny, evergreen foliage persists until June.

The airy, crystalline red flowers of *Nerine sarniensis* appear shortly after those of the "Oxblood Lily" and then bloom concurrently with them for several weeks in wonderful contrast of shape and color weight. *Nerine* foliage is somewhat the more glaucous of the two, of a bluer green, and there is a distinct little whitish midrib down the center. In winter this little foliage contrast is quite valuable where the two are planted together.

Sternbergias usually follow the *Nerine-Hippeastrum* combination very closely and continue to bloom for as long as six weeks after they have passed. These cheery little yellow flowers are apparently frost proof. They can be counted upon, in seasons when they do not start blooming too soon, to provide good color through the middle of November.

The leaves of *Hippeastrum*, *Nerine*, and *Sternbergia* are almost as valuable as the flowers. These bulbs provide for Southern gardens, where the winter aspect is almost as important as that in summer, a green ground cover, together with an abundance of flowers in the fall. For many years, *Nerines* and *Sternbergias* have been used to edge the beds of old gardens in Eastern Virginia and Maryland. *Sternbergias* are small enough in stature to be attractive at the very front, but *Nerines* should be planted somewhat back in beds if they are not to hide any lower fall-blooming perennials. Perhaps the commonest use of *Nerines* is in strips down the sides of paths. Here they form wide bands of brilliant color which is particularly surprising in Fall when one hardly expects such a demonstration from bulbous plants. This wholesale use of *Nerines* has always seemed to the writer a bit like using diamonds for paving purposes, however, because the exquisite form of the flowers is almost totally lost. They are seen to best advantage where they can rise in small groups from some kind of herbage not over a foot high, and the airy flowers can float and dance over the beds like so many butterflies.

All three of these bulbs naturalize successfully if their few cultural requisites of drainage and exposure to winter sun are satisfied. They are especially beautiful planted in drifts under high, deciduous shrubs, such as Lilacs, Philadelphuses and *Spiraea van Houttei*. The evergreen foliage is particularly pleasing to the eye in winter when the leaves are off the shrubs, and in summer their bare locality cannot be seen. Around old houses, in some places in the South, where the deciduous trees have gradually taken the garden, *Nerines* and *Sternbergias* may be found still thriving and multiplying. The overhead branches probably help to break the frost and at the same time to prevent the winter's sun from thawing them out too rapidly in the morning, after a cold night.

The *Cooperias* and some of the hardy *Crinums* are sure to be still blooming in the Fall, also a few *Zephyranthes* flowers if there is any rain. *Crinum fimbriatulum* really gives its best blossoms just at the right time to be the feature in Fall flower shows. Then, in very late Fall, *Galanthus byzantinus* and *G. Elwesii* are almost sure to flower sometime before Christmas in the warmer sections in rock gardens. Possibly we shall be able to procure *G. nivalis Olgæ* and *G. nivalis Racheliae* for our gardens here some day, also *Leucojum autumnale* mentioned by Mrs. Peckham some years ago as of doubtful availability.

WINTER

The open winters of the Southern States are to be thanked for the flowers of Polyanthus Narcissi and many kinds of snowdrops in January and February. There is a growing interest in winter gardens, and one of the good results of the rock garden craze is that people are paying more attention to the little bulbs such as *N. minimus*, *N. cyclamineus*, *Galanthus nivalis*, *G. Elwesii*, *Leucojum vernum* and others as they become available. As companions for these bulbs one may conveniently use the winter-flowering irises, crocuses, and *Bulbocodium vernus*, *B. versicolor*, *Chionodoxa*, *Hyacinthus Azurea* and the very attractive little *Eranthis hyemalis*.

SPRING

One needs only to mention the *Narcissi* and *Leucojum aestivum* in March and April. Then, with April and May come the dainty little golden yellow flowers of *Hypoxis erecta*, milk white meadows of "Atamasco Lilies" and pots of *Hippeastrum Johnsoni*, *Clivias* and *Eucharis* in the flower shows all over the South. In gardens one can have *Zephyranthes carinata*, which blooms in May, as a rule, and then off and on during the summer. A wonderful companion-piece for *Hypoxis* is "Blue-eyed Grass," *Sisirynchium* species. The two are of nearly the same height and make ideal ground covers to follow the early bulbs in the rockery or woodland.

If *Zephyranthes* look silly in threes and fours, they look more ill-at-ease perched on top of rock gardens where they will usually scorch to death. The little bulbs of *Zephyranthes atamasco* seem to thrive almost anywhere they are put, but the best place for them in the garden is near a pool, in a bog garden itself, or best of all, in the drain-off from the pool or along a streamside in sun or half shade. Cypress Gardens in South Carolina offers a most dramatic example of good use of this subject. The bulbs can hardly be planted in too wet a place, provided water does not actually stand over them for long at a time, for the little roots apparently come up for air. In digging them, one cannot fail to notice how the roots follow right up the sides of the bulb toward the top, instead of going down like most roots, so that they form a little threadwork over the bulb.

SUMMER

Cooperias and *Zephyranthes carinata* are very likely to produce a few flowers in spring and early summer, and *Chlidanthus*, some *Hymenocallis* species and various hardy *Crinums* will flower in June, but the most useful season of the amaryllids comes after July 15. One may expect the flowers of *Lycoris squamigera*, *L. aurea*, *Amaryllis bellodonna*, *Z. rosea*, *Z. candida*, and others if they are available, many *Crinums*, *Hymenocallis* and *Alstroemerias* at any time after a good rain (if any) from mid-July to mid-August. All of these valuable and showy August flowering subjects should be carefully planted where there is no chance of their being missed when in flower, for the smaller ones can come and go unseen in a large garden in some out-of-the-way place. There appears to be a temptation to put them in some "safe place" because of the danger of cutting into the bulbs, especially those of the "naked-flowering" ones, but they can be too safe, for people do not go far to see things in their gardens in August.

BUYERS' GUIDE

In the following pages the foremost dealers in amaryllids and the necessary accessories for their culture display their varied stocks. These stocks are becoming more complete with each issue of *Herbertia*.

The advertisers are to be commended for the support they are lending to the worthy enterprise of advancing the amaryllids. Most of them have written that they consider it not more than proper that they do what they can to show that they are backing the officers in the only way that really counts. They have done their share, and merit the patronage of the reader.

If the amaryllid enthusiast is to show yearly progress, he should procure for his collection some new types and varieties each season. In the northern sections, for outdoor culture there is a wealth of material—narcissi in great variety, sternbergias, galanthus, alliums, lycoris, hemerocallis, etc. For indoor culture there is no limit except the available window, conservatory or greenhouse space. In the southern sections untold treasures await the collector which can be grown outdoors in many cases without protection. The more tender forms can be managed with some slight winter protection.

In making out his list, each buyer should of course be guided by what his purse can afford. Progress can be made by steady accumulation of worth while items. Even the addition of one or more new types or varieties each year will build up to an impressive showing in a number of years. It will add variety and interest to your collection and will put it in a higher rank than the commonplace collections usually met with.

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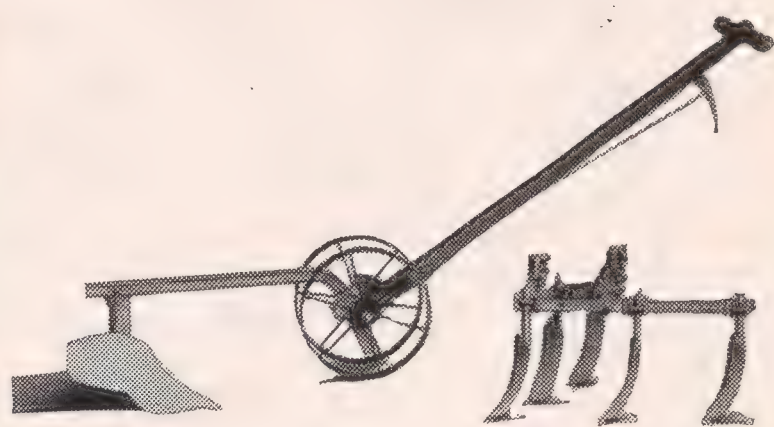
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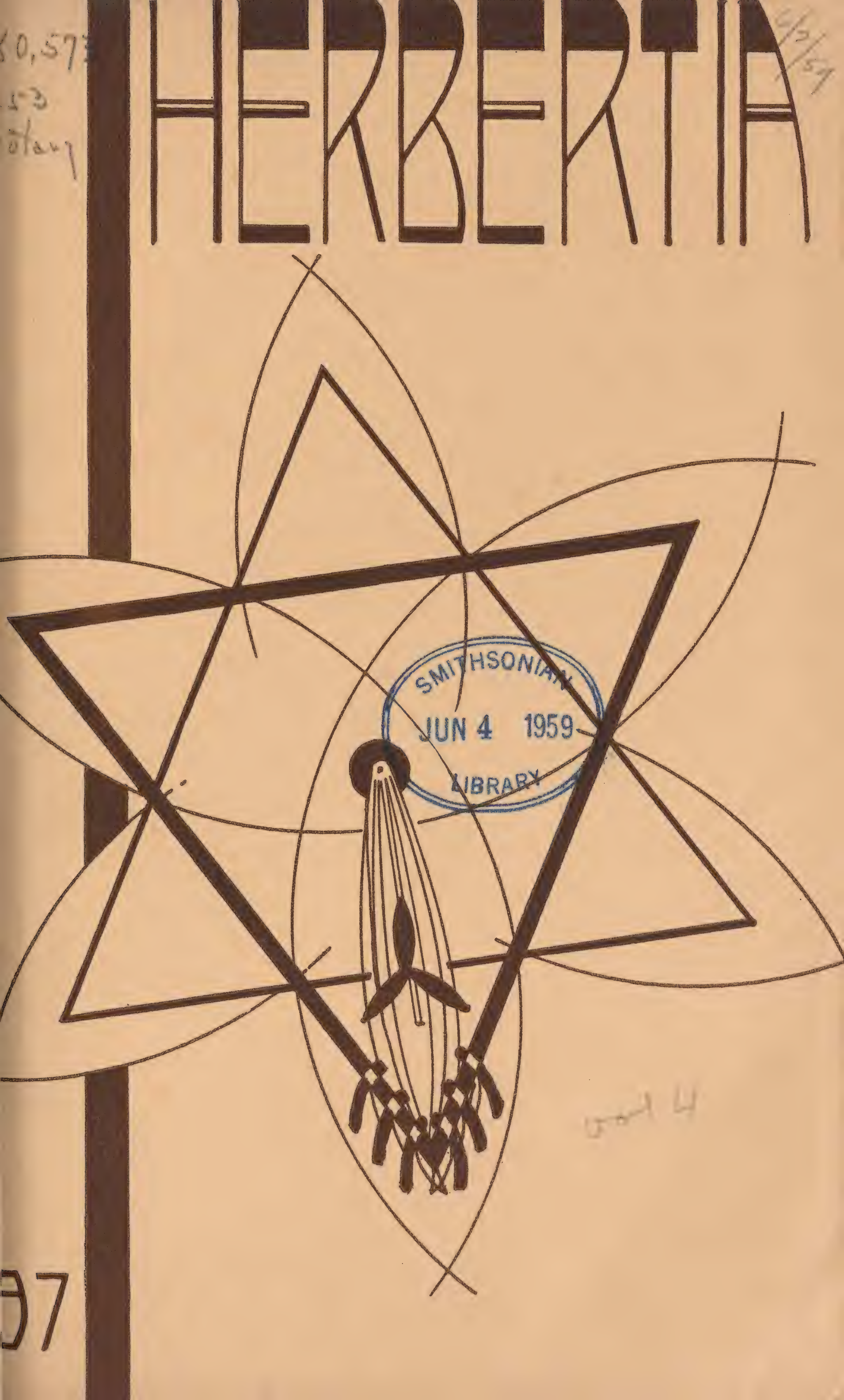
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VOLUME 4

DEDICATED TO THE MEMORY OF

WILLIAM HERBERT,

1778-1847

EDITED BY

HAMILTON P. TRAUB

Mira Flores, Orlando, Florida

ORLANDO, FLORIDA

THE AMERICAN AMARYLLIS SOCIETY

1937

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AMERICAN AMARYLLIS SOCIETY

Printed in the United States of America

Published October, 1937

This volume contains two portraits, forty-four other plates and three figures.

INTRODUCTION

The dedication of the present volume of HERBERTIA to the memory of the Hon. & Rev. William Herbert is very appropriate since this year marks the centenary of the publication of his AMARYLLIDACEAE, a work that needs no introduction to anyone interested in this fascinating family of flowering plants.

Although Herbert devoted a great deal of his time to the study of the Amaryllidaceae, he also gave a considerable amount of attention to the subject of plant-hybridisation, and recorded his experiences and conclusions in three papers published at intervals over a period of twenty-five years, (*Trans. Hort. Soc. London*, IV. 15-50: 1822; AMARYLLIDACEAE, 335-380: 1837; and *Journ. Hort. Soc. London*, II. 81-107: 1847), the last one appearing just before his death.

Herbert's work on hybridisation is now of little more than historical interest, so greatly has our knowledge of heredity and plant-breeding advanced since the re-discovery of Mendel's work in 1900, but in his own day Herbert did much, no less by his example than by his writings, to encourage and popularise the practice of hybridisation, with the result that many beautiful hybrids were added to the number of garden-plants.

It may also be mentioned that Herbert was one of the few biologists of his time to combat the doctrine of special creation, and to favour the suggestion that the species within a genus, and even allied genera themselves, might be descendants from a common ancestor, views that affected to no small degree his treatment of taxonomic problems.

It is chiefly for his work on the taxonomy of the *Amaryllidaceae* that Herbert is remembered today, for this work is still of practical importance. Until Herbert's time the classification of the family was in a state bordering on chaos, as may be seen from the fact that no fewer than twelve distinct genera were included within the limits of the one genus *Amaryllis*, and we owe a great debt to Herbert for his work in clearing up the confusion and setting the classification of the family on a sound basis. Herbert took the view that the genus was the most important unit in classification, and he took great care, not only that the plants he referred to any one genus should have characters in common, but also that each genus should be sharply distinguished from other genera by some constant feature or features.

How well he did this work may be judged from a comparison of the genera recognised by Herbert with those accepted in the second edition of Engler's PFLANZENFAMILIEN, volume XVa, which appeared in 1930. Of the eighty-three genera enumerated by Herbert in his AMARYLLIDACEAE, fifty-six are maintained in the PFLANZENFAMILIEN, and of the remaining twenty-seven, no fewer than twenty rank as distinct sections of the genera to which they are reduced. It may be added that more recent research has led to the resuscitation of three of the genera recog-

nised by Herbert which were reduced in the PFLANZENFAMILIEN. It is also interesting to note that eighteen of the genera which Herbert himself established are maintained in the PFLANZENFAMILIEN, and that all of them belong to the subfamily *Amaryllidoideae*, which consists of some fifty-five genera. If to these are added two of the recently resuscitated genera which were first proposed by Herbert, we find that Herbert was responsible for twenty genera out of the fifty-seven now recognised in the subfamily *Amaryllidoideae*.

As to Herbert's concepts of the limits of the family, this is still followed for the most part in the PFLANZENFAMILIEN, the only alterations being that the three genera which formed Herbert's suborder *Xerophytea* have been segregated as a distinct family the *Velloziaceae*, and that the four genera which Herbert had as section *Dioscoreaeformes* of suborder *Agaveae* are now made a separate family *Dioscoreaceae*.

The excellence of Herbert's work may perhaps be traced to two circumstances. Firstly he had the incomparable advantage of working to a great extent with living plants, most of them grown in his own garden at Spofforth under his personal supervision. He was thus in a position to study the plants through all stages of their life-histories—a circumstance of which he took full advantage, as his writings show. Secondly Herbert was an artist of considerable merit and constantly employed his talent in depicting his plants, and in making drawings to elucidate their structure—an occupation that entailed, as a matter of course, close and critical examination of the material before him. To this circumstance may be traced the accuracy and minuteness of observation which is one of the leading characteristics of Herbert's work.

Many of his paintings and his observations enrich the pages of the *Botanical Magazine* and the *Botanical Register*, whilst all the forty-eight plates in his AMARYLLIDACEAE are the work of his own hand. It has been computed that in all Herbert drew some hundred and eighty-five plates, many of them crowded with figures.

Herbert's AMARYLLIDACEAE embodies much of the wide knowledge he had gained of this interesting family, and the fact that a hundred years later this book should still be indispensable to any serious student, is, in itself, a high tribute to the botanical prowess of its talented author.

August 27, 1937,
Royal Botanic Gardens,
Kew, Surrey.

ARTHUR W. HILL.

P R E F A C E

The biography of William Herbert is long overdue.

—ARTHINGTON WORSLEY.

At long last we have an interesting and authentic biography of Herbert, and we are fortunate in having it from the pen of Arthington Worsley. In addition one of Herbert's essays on plant breeding, written in a charming style and published in 1837, is reprinted in full in this issue. The place of Herbert in the history of science is discussed in a most valuable paper by Dr. Darlington of the John Innes Horticultural Institution, London. We cannot thank Dr. Darlington too much for this outstanding favor to the members of the Amaryllis Society.

The present issue of HERBERTIA represents a rich harvest, so rich indeed that in this short preface reference can be made to only part of even the most important contributions. The excellent article by Dr. Darlington has just been referred to, but it represents more than fixing the place of Herbert in the history of science for it throws new light on the gradual growth of the concept of evolution and the science of genetics. We will all read and reread this important paper. Many will be interested in the review of chromosome numbers, as far as determined at present for the Amaryllidaceae, by Doctors Flory and Yarnell of the Texas Agricultural Experiment Station. It will provide food for thought for those interested in the interrelationship of the species and genera in this plant family.

There are also important articles by Dr. Stout, on daylilies, and by Mr. James, especially those on the culture of *Leucocoryne*, and the control of the Lesser Narcissus Fly. We are also most grateful to the contributors in South Africa, Kenya Colony, Australia, England and Germany. We wish to call particular attention to the articles, by Doctors Dyer and Creasey of South Africa, which contain some important information about cultural requirements of amaryllids.

Special note should be taken of the article on forcing bulbs by Mr. de Graaff, and also the paper by Mr. Heaton on the same theme, for this subject will be more thoroughly explored in the 1938 HERBERTIA. Dr. Grainger, Curator of the Tolson Memorial Museum, Ravensknowle, England, will contribute a review of the whole subject, and Prof. Dr. E. van Slogteren, Director of the Laboratorium voor Bloembollenonderzoek, Lisse, Holland, will furnish a paper on his interesting experiments in this field.

The breeder of hybrid amaryllis (*Hippeastrums*) should note carefully the hybridization method followed by Mr. Pierre S. du Pont. The general recognition and application of the principle underlying this procedure marks a genuine advance in this field. Others are also using this method but he was evidently the first to use it on a major scale in producing finer and more delicately colored hybrid amaryllis, and he was first to achieve important practical results.

The first award of the Herbert Medal was unanimously voted to Mr. Worsley, and soon nominations will be received for the award in 1938. There are a number of amaryllid enthusiasts who have rendered distinguished service in the field of the Society, and the Board of Directors

has voted to award at least three medals each year for a short period, at least until overdue honors have been bestowed. Thereafter, the medal will be awarded to only one person annually.

Mr. Wyndham Hayward, the brilliant, wide-awake and efficient Secretary of the Society, has now carried on his duties faithfully for four years and during that period the organization has been built up largely through his efforts into a thriving and efficient unit for the advancement of the amaryllids. The task of Secretary for such an organization is not an easy one, but it has been lightened somewhat on account of his great enthusiasm. However, lately he has been ill at times, and on orders from his physician, he must curtail his many activities in order to conserve his nervous energy. The Board of Directors has accordingly appointed an Executive Secretary, Dr. A. E. Hughes, to assist the Secretary. Dr. Hughes is a soil scientist in the Bureau of Plant Industry, United States Department of Agriculture, and amaryllid culture is his avocation. He is a talented and indefatigable worker, and his experiments with amaryllids at his Orlando home are important in that they break new ground.

The 1938 HERBERTIA will be dedicated to Mr. Ernst H. Krelage. The special feature of this issue will be the Krelage autobiography which is now in preparation. He will also contribute some notes on the history of amaryllid culture in Holland. As far as possible, the history of amaryllid culture in the rest of Europe will also be included. An appeal for amaryllid histories is here made to those interested in France, Italy, Germany and other European countries.

HERBERTIA for 1939 will be dedicated to South Africa. The leading features of this issue will be supervised by Doctors Dyer and Compton. The 1940 volume will be devoted to Latin America; the 1941 issue to Australia, and the 1942 number to Major Albert Pam.

The tenth anniversary issue, in 1943, will be dedicated to those who have been active in reviving interest in the amaryllids during the preceding ten years. It will constitute a comprehensive review of the advances made since the Society was organized in 1933.

—HAMILTON P. TRAUB,
Editor.

Mira Flores,
Orlando, Florida,
July 20, 1937.

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Year Book Correspondence. Correspondence regarding articles and illustrations for *Herbertia*, the Year Book of the American Amaryllis Society, is cordially invited. The annual news-letter or articles from Corresponding Members and Regional Chairmen of Trial Collections should be forwarded, if at all possible, by April of each year, or earlier, depending upon the distance, so as to reach the editor in ample time for publication.

Manuscripts should be typewritten if at all possible and double spaced; photographs should have the **name of the owner** to whom credit should be given, and the **name and size of the subject**, written on the back.

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This volume of Herbertia
is dedicated to the memory of
The Hon. and Very Rev. William Herbert, 1778-1847
Dean of Manchester
in celebration of
the 100th anniversary of the publication of
his enduring work—
Amaryllidaceae
in 1837



From the Painting by Sir William Beechey

William Herbert

THE BIOGRAPHY OF THE HON. AND REV. WILLIAM HERBERT,
1778-1847

ARTHINGTON WORSLEY, *England*

The biography of William Herbert is long overdue. It is a record of amazing intellectual vigor which, not to be contained within boundaries, broke out in all directions.

Great men are often held up as exemplars to future generations. In this case there are few, indeed, who could compete on the wide field over which his thought and work ranged. Of him to whom many talents are given, much is required, and he gave his best to the world, good measure, pressed down and running over.

No great man in modern times has left fewer personal records that may be easily traced than has William Herbert. I could find only a single portrait, painted when Herbert was seventeen years of age, at Eton, by Sir William Beechey, and which is reproduced, with the kind permission of Lord Hugh Cecil, Provost of Eton, in this volume of *Herbertia* (Plate 44). At the Spofforth Rectory where he lived for more than three decades there is no memorial to him.¹ Even his place of burial has been forgotten. One magnolia (Plate 47) planted by him is still alive in the old rectory garden of Spofforth which he planned and laid out, and of the "host of crocuses" planted there by him, the inhospitable climate has allowed many to survive to this day.

Pictures of the Rectory and Church have been secured by the kind collaboration of the present Rector, the Rev. Nelson O. Butler and are reproduced in this volume (Plates 45 and 46). The photographic copy of Herbert's signature, appearing under his portrait (Plate 44), was taken from the Spofforth Church register. But his work lives and enlightens past and present generations. This is the real test of greatness.

In this brief outline biography, we can do no more than touch on the varied activities of William Herbert. He acquired mastery of languages early in life, and became a creative literary artist during his college and university days. Following graduation he was briefly occupied as a lawyer and parliamentarian, but he finally found anchorage as an ordained minister. His boundless energy was more than sufficient to do full justice to his vocation and overflowed mainly into science—chiefly plant science and to a lesser extent into animal biology, particularly ornithology.

The valuable paper by Dr. Darlington of the John Innes Horticultural Institution, also appearing in this volume gives a critical estimate of Herbert's place in the history of science, and it is also very fortunate that Herbert's essay, *On Crosses and Hybrid Intermixtures in Vegetables*

¹The Rev. Nelson O. Butler, present Rector of Spofforth, writes under date of April 25, 1937,—“I wonder whether the Society (American Amaryllis Society) . . . would consider placing a tablet or window in the chancel of the Church to the Dean's memory. There is no memorial to him here where he lived for, I think, 33 years.”

is reprinted in its entirety in this volume. This will serve as an excellent sample of his scientific writing.

William Herbert was born on January 12, 1778. He was the third son of Henry Herbert, first Earl of Carnarvon, by Lady Elizabeth Alicia Maria, eldest daughter of Charles Wyndham, Earl of Egremont.

His formal education began at Eton. He showed his brilliancy early in life for he edited a volume of poetry in 1795 while still at Eton, and on finishing his preparatory education, he obtained a prize for a Latin poem.

On July 16, 1795, Herbert matriculated from Christ Church, Oxford, but soon migrated to Exeter College where he took his B.A. degree on June 9, 1798. Later he moved on to Merton College, Oxford, and received his M.A. degree on Nov. 23, 1802; the B.C.L. on May 27, 1808; and the D.C.L. degree on June 2, 1808.

At first he inclined to a political career, and he was elected member of Parliament for Hampshire in 1806 and for Crockledale in 1811, and he appears at some time to have practiced at the Bar.

But soon after retiring from political life in 1812, he completely changed his plans, and entered the ministry. He was ordained in 1814 and was presented in that year with the important rectorship of Spofforth in the West Riding of Yorkshire, which was in the gift of Lord Egremont. It appears that previous memoranda about Dean Herbert, to the effect that he was promoted to the deanery of Manchester in 1840, demand emendation, for the Diocese of Manchester was not created until 1847, previous to which date he held since 1840² the wardenship of the Manchester Parish Church, to which he drove from Spofforth Rectory by means of post horses. He was, in 1847, made the first Dean of Manchester, but it is doubtful if he actually officiated as Dean of Manchester for more than a short time for he died suddenly in his own house in Hereford Street, Park Lane, London, on May 28, 1847.

On May 17, 1806, Herbert married the Hon. Letitia Emily Dorothea, second daughter of Joshua, fifth Viscount Allen, and was the father of Henry William Herbert and three other children.

Some particulars of his family at Spofforth may be of interest. His wife delighted in gymnastics and Herbert caused a high wall to be built to screen a part of the garden from the observation of the neighbors. Some state was observed on ceremonial occasions, and when his daughters went from the 30-room rectory (Plate 45)³ to the Spofforth Church for Divine Service, pages followed them carrying their books, saw them into their pew and shut them in. The Rectory was always known locally as "The Doctor's", probably for the reason that he lived there for 33 years before he became Dean. It is somewhat remarkable that a world-wide reputation should have clung to this latter title.

² It was in 1840 that he received the B.D. degree from Merton College, Oxford.

³ The Rev. Nelson O. Butler writes under date of Apr. 25, 1937,—"The house (Rectory) has been reduced in size. When I came here it had 30 rooms—now there are 20, but what is left is exactly as it was in his day The Church has been rebuilt since his day (in 1854) except the tower which is 15th Century and the Norman ascades in the nave."



Spofforth Rectory and Garden



Spofforth Church

BROAD INTERESTS OF DEAN HERBERT

Herbert achieved eminence as a classical scholar, linguist, and naturalist. In this section we will take a glance at Herbert's achievements as a scholar and linguist, and this will be followed by brief separate sections on his religious work and avocation of naturalist.

While still at Eton he published, in 1795, a book entitled *Musae Etonensis*, and in the same year he won a prize, on leaving Eton, for a Latin poem entitled *Rhenus*. In 1801 he published a small volume of Greek and Latin poetry,—*Ossiani Dardania*, and this was followed in 1804 by part one of *Select Icelandic Poetry* translated from the originals with notes. The second part appeared in 1806. These two works are important since they constitute the first adequate rendition of ancient Scandinavian literature in English. Herbert's translations from the Icelandic were considered of such importance by Byron that he wrote, in his *English Bards and Scotch Reviewers* (1809),—

*Herbert shall wield Thor's Hammer, and sometimes
In gratitude thou'lt praise his rugged rhymes.*

His exceptional command of languages is attested by other translations of German, Danish, and Portuguese poetry in 1804. He continued his literary work with articles of a non-political nature in the *Edinburgh Review*.

In 1815 followed *Helga*, a poem in seven cantos, and in 1820 he published *Hedin, or the Spectre of the Tomb*, a tale in verse from Danish history, and also *Pia della Pietra*, and *Iris*, a Latin ode. In 1820-21 appeared *Wizard Wanderer of Jutland*.

Beyond his religious work for the Anglican Church and for his own flock, his books and studies on horticulture and botany (of which a fairly complete list is given in the bibliography), he had a great interest in the Sagas, in Norse epic poetry and tradition, much of which he rendered in poems and allegorical works in English, Greek and Latin. Such works antedated the reawakening of the Germanic and Scandinavian races to their ancient religious beliefs. The substratum of this movement lies in the assumed intellectual superiority of the Indo-Germanic races as delineated in the works of the Comte de Gobineau and of Richard Wagner, reinforced by the "rediscovery" of the old Nordic gods. Civilization proceeds in this way, and we see the long ignored and forgotten efforts of individuals finally built up into great national movements.

It should not be said that by writing on the Sagas and on Norse divinities Herbert unwittingly did something to deflect Christian beliefs into other channels. The Old Testament Divinities had already been pushed to one side by the churches of Europe, and the Christology of St. Paul established in its place. But still we find, outside Christendom, the worship of ancient racial heroes is practiced. In Japan, the Holy Emperor, whose ancestors are considered as descended from heaven many thousands of years ago, retains his ancestral status, and Tennyson was not accused of derogating Christian beliefs by bringing into public

prominence such legendary characters as King Arthur and Merlin, although he granted to both his heroes at least semi-divine status.

These great men of the past are all divine in one sense, they are all Sons of God, as all Christians and all Greeks have ever claimed and as every man that ever existed must be. Some may have "scoured off the dust from the mirror of the mind." Some may have "Swept out the chamber of the heart and made it a fitting place for the dwelling of the Beloved." Let them all be honoured that deserve honour, however far we may be taken back through the mists of history or legend to that "first ray of golden Light."

HERBERT'S RELIGIOUS WORK

Herbert did much work in the religious field, mostly from a historical standpoint and as a defender of the faith embosomed in Christianity. As will be realized by reference to the bibliography of Herbert's works, a great portion of his life's work lay outside the sphere of botany and horticulture. One cannot omit some reference to his theological views and work, although such references must be rigidly curtailed, as it would require a volume of some size to deal with his work outside the proper limits of the publications of the American Amaryllis Society. However, *Herbertia* must deal with Herbert from all points of view. There is no doubt but that in his *Amaryllidaceae* we possess his master work but much light is thrown upon his life and times by his ecclesiastical and classical writings.

These take us back into a world of religious thought so far removed from the ideals of today that the whole panorama disclosed before Herbert's eyes seems to have now vanished. To recover this vision we must picture to ourselves that the great engine of Torquemada had back-fired into the very foundations of the Anglican Church. Real live devils sought to undermine Christian traditionary worship and to upset faith, and unbelief in what one was told was a crime and not merely an error of judgement. This was the world in which Herbert lived and taught. He was severely orthodox. Like Socrates, he knew the Good, and he wished to make everyone good. The pictures of Martin, which at one time hung on the wall of every devout Anglican churchman's home, depict the unrighteous going down quick into the pit, among whom are prominently shown many mitred bishops and ladies of obese tendencies—after the style of the pictures of Rubens. Let us hope that the juxtaposition of these two classes of the damned was purely fortuitous on the part of the artist.

The prevailing orthodoxy of the day is clearly traceable in Herbert's discourses, combined with an element of reciprocity which suggested to his flock that they should get what was possible out of religion, and obtain in a future beatific state what most of them had missed in this life here below. With dogmatic certainty he clearly expounded his credo, but fresh crusades against the unbeliever formed no part of his teaching. He inculcated the need for progressive improvement in the morals of his flock based upon the unwavering belief in his teachings. Perhaps the rural congregation at Spofforth may have been terrified by his denuncia-

tions, but as good countrymen in daily touch with nature, took it all in good grace.

Those interested in this phase of Herbert's many sided career should refer to his religious writings. In 1820 he published a volume of *Sermons* which was reviewed in *Gentleman's Magazine* in 1843 (Part I, p. 115). This was followed in 1838 by an epic poem, *Attila, or the Triumph of Christianity*. Subsequently he advertised *Attila and his Predecessors*, an historical treatise, but this may not have been published. A final volume of poems, *The Christian*, appeared in 1846.

HERBERT, ORNITHOLOGIST, SYSTEMATIC BOTANIST, AND PLANT BREEDER

As a naturalist Herbert devoted most of his energy to systematic botany and plant breeding. However, he was a good hunter, and contributed many closely printed pages of ornithological notes to *White's Selbourne*, published in 1832 by Prof. Rennie; and later, in 1837, Bennett's edition of the same work contains many of Herbert's notes on ornithology. Herbert also drew the title-page illustration for Rennie's edition.

We come now to the climax of Herbert's career, the publication of his *Amaryllidaceae* in 1837. With the lapse of a century, all of his other works have become secondary to his exceptional masterpiece on systematic botany. No one can study this treatise without realizing his great constructive and analytical talent, although here and there one may detect signs of dogmatism, this is on the whole a very minor note.⁴

He must be placed among those favored few, whom a fairy has touched at birth, and who did everything well that he took in hand. The wide field of work over which his labors extended shows conclusively the universality of his genius and in no way eclipses, as has already been pointed out, his best known work—*Amaryllidaceae*—to which, even after the passing of a century, all men turn for information on this subject.

What is most worthy of admiration is the remarkable thoroughness of his work, and the foresight shown in his arrangement. For he brought an ordered sequence out of the confused and often contradictory matter which his precursors had left for him and which they had only studied piecemeal.

He had given years of study to the amaryllids and study of a kind which previous authors had not given. He was what we moderns call a "liaison" man between the worker on dried specimens in the herbarium and the gardener. For he lived with his plants, watched them growing and only used dried specimens to fill in the lacunae left by the absence or inaccessibility of certain plants in a live condition. Even in so doing he was doubtful if some monkey-trick had not been played upon him, and "the inflorescence mismatched with the foliage." Sometimes his doubts were well founded, for the anthropologist who seeks for confirmation for his theories by examining a mummy may be unaware that it has been squashed and contorted out of all recognition of what

⁴ See Herbert's remarks on the genus *Eustephia*; *Amaryllidaceae*, 1937, p. 156.

the living man had been like. In the case of a mummy of a great king who had lost his head in battle, some doubt might arise as to head and corpse being subsequently mis-matched; and as to any mummy which might have been made of Harold or of Cromwell, this doubt would have become a certainty.

During the progress of his great work he was in a position which no previous writer had been able to occupy. Until the development of heated glass house structures it had been impossible to examine, or even to grow the classes of exotic amaryllids which flower or grow in the winter season.⁵ In Herbert's time this hindrance was in the process of being overcome. Moreover, he was a gardener as well as a botanist and methodologist. He wrote about what he had grown and watched and therefore his resulting observations are incomparably more valuable than those made by a systematic botanist in his study.

One can surmise, without having definite proofs, what first turned Herbert's mind to the love of amaryllids. His published works on this subject belong to the latter part of his career but if we allow 12 years for study of the subject and for the preparation, correction and publication of his *Amaryllidaceae* we are taken back to 1825. Now his father personally introduced several species of *Hippeastrum* into cultivation in 1820 — notably *Harbanthus bifidus* (Herb.) and *Hippeastrum stylosum* (Herb.) and the Geneva Botanic Gardens (A. DC. Pl. Rar. Hort. Gener., t.9) named as *Carnarvonia* a garden form, near *H. reginae*, but thought to be a hybrid. All this looks as though, (long before 1825, perhaps), his father had been a cultivator of amaryllids. Herbert's life when at home, at *Highclere*, may have been passed among these plants and he may have fallen a not unwilling victim to this form of beauty-worship when a young man. It is worthy of record that he described both of his father's specific introductions. At least we know that he followed up a line of horticulture in which his father already excelled. Once started on this line the utter confusion then existing in the whole Order must certainly have led an ardent methodologist to gird on his armor for the fray—from which he emerged victorious. That was one thing done and we have been saying "thanks" ever since.

A perusal of Herbert's *Amaryllidaceae* shows that he was a systematist of the first order. He was not satisfied to look at his task in a fragmentary way in the manner of the ordinary taxonomist. He proposed a phylogenetic arrangement of the monocotyledons in which he sought for natural groupings. The philosophy expressed in the introduction is quite modern, but the facts available in his day were meager as compared with those now at hand. On the basis of the available facts his arrangement is admirable. Lindley's work on systematic botany appeared in 1836, and Herbert includes a critical estimate of this work. Having satisfied himself as to the probable relationship of the group in which he was interested to the rest of the monocotyledons, he proceeds with his phylogenetic arrangement of the amaryllids.

⁵ Excepting in the case of some hardier kinds, such as *Amaryllis*.



C. Maurice Steevens, Harrogate

See page 13

Magnolia planted by William Herbert and still living

His arrangement of the Amaryllidaceae is based on such sure insight that even today, for instance as recently as May of the present year (Sealey, Jour. Royal Hort. Soc.) the genera *Habranthus* and *Pyrolirion* which had been erased since 1888 by Baker, have been reinstated.

The text is not after the fashion of the hack taxonomist for interesting notes on culture, and on contemporary workers are liberally dispersed among the necessarily formal descriptions of genera and species.

Herbert's botanical and genetic work is especially exemplified in his essay entitled *On Crosses and Hybrid Intermixtures in Vegetables* which is appended. In this he shows himself a cosmopolitan plantsman and eminent pioneer plant breeder. Since Dr. Darlington's valuable paper concerns this phase of Herbert's career, all that need be said here is that Herbert not only was a pioneer breeder of amaryllids but also of gladioli, azaleas, camellias, calceolarias, camellias, azaleas and many other plants.

Among nerines he raised the following hybrids—*Mitchamiae* (*curvifolia* x *undulata*), *Haylocki* (*curvifolia* x *pulchella*), *pulchella* x *undulata*, *pulchella* x *humilis*, *humilis* x *undulata*, *curvifolia* x *venusta* and *Spofforthiae* (*venusta* x *undulata*).

Baker states that "A large number of crinums were artificially hybridized by Dean Herbert, *C. longifolium*, *Americanum*, *erubescens*, *asiaticum*, *scabrum* and *zelanicum* being principally used by him."

In the *Amaryllidaceae* Herbert enumerates a large number of hybrid *Hippeastrums* raised by himself at Spofforth, and also many varieties raised at his ancestral estate, Highclere.

Herbert contributed articles about amaryllids and other horticultural and botanical subjects to the *Journal of the Royal Horticultural Society*, the *Botanical Register* and *Curtis's Botanical Magazine*. Among the most notable of his later horticultural works is the series of papers on *Crocus* species (*Crocus Synopsis*), which appeared in the *Botanical Register* between 1843 and 1845. He had just finished revising this series of articles when he passed away, and the work was published separately as the *History of the Species of Crocus*, after his death in 1847, under the editorship of Lindley.

HERBERT'S CONTEMPORARIES

Mrs. Bury in her *Hexandrian Plants* published in 1831-34, hand-painted with scrupulous care her illustrations and gave us the best illustrated work on the amaryllids that exists. She refers to Herbert's Genus *Hippeastrum*. Her work was put together in Liverpool and she records the help she received in the donation of specimens from Richard Harrison of Liverpool, J. R. Gowers, Prof. Lindley, Mr. Griffin of South Lambeth and from the Liverpool Botanic Garden. During those years Mr. Harrison was receiving many *hippeastrums* from Brazil and in his honor Prof. Lindley named *H. Harrisoni* (which is probably the same species as the one which is now called *H. ambiguum* and is as hardy as *H. vittatum*).

She figures several interesting hippeastrums which are now unobtainable, particularly *H. crocatum*⁷ which is the only really yellow hippeastrum that is known. The segments are remarkably attenuated towards their long tapered tips. The leaves are very dark, very glaucous on the back and 3 inches wide. It cannot be difficult to cultivate for her drawing was made in 1826 from a bulb said to have been imported from Sao Paulo (together with *H. psittacinum*) 16 years previously. In my experience very few bulbs of hippeastrum have an individual life of 16 years in our hothouses, but offsets or seedlings may have carried on the life history without much change. But there are many other possibilities, such as that the comparative absence of brilliant light in old-fashioned hot-houses may have admitted of a pure yellow coloration in a plant that in full sunlight may have been orange colored. Still, quite apart from color, the plant drawn by Mrs. Bury is distinct from all others seen by myself, and the accurate coloration in all her other portraits gives credence to accuracy in this instance also.

Among her illustrations is the alleged hybrid *Hippeastrum Johnsoni*. Around this plant myths have arisen and it is puzzling to reflect how one scientific book after another has accepted these myths in sincere and perfect faith. It is very interesting but unscientific for investigation at the source has been possible ever since 1831-34. Mrs. Bury figured the original plant, *the Johnsoni*, given by the original Johnson himself to Edward Faulkner of Liverpool, guaranteed by the giver to be the original *Johnsoni* and drawn by Mrs. Bury herself. One feels inclined to ask "If this is not *Johnsoni*, what is?" But the alleged parentage of this plant is guess work and very bad at that. Let us grant to Johnson the mantle of a prophet who foresaw in a vision what might be done.

Among the hippeastrums figured by Mrs. Bury it is worthy of note that some bore umbels of 8 flowers to the scape. This was specially the case in those plants nearest to *Hippeastrum rutilum fulgidum*. I have seen crosses of this type with 10 flowers to the scape. This was half a century ago in a greenhouse in York. Of late years we only see the regulation 4 flowers, with an occasional atrophied fifth bud.

Miss Rosenberg's work, the *Corona Amaryllidaceae*, published in Bath in 1839, contains colored plates of five reported hybrid hippeastrums. Mrs. Loudon's *Ladies' Garden of Ornamental Bulbous Plants*, published in 1841, contains many colored plates of amaryllids and refers to Herbert.

P. J. Redoute's *Les Liliaces* published in Paris, in parts, contains portraits of the highest merit of amaryllids and other hexandrian plants. The cost was, and remains, very high. It was slightly pre-Herbertian in date.

During his life-time several cultivators assisted independently in the description of amaryllids. Notably Messrs. Garraway of Bristol, the Liverpool Botanic Gardens, and Messrs. Van Houtte in Belgium. The latter published many excellent colored plates in *Les fleurs des Serres et des jardins de l'Europe*, and stood all by themselves for many years in the culture of these plants.

⁷ *Hippeastrum rutilum* var. *citrinum* Baker.

Rather later good work was done by many, amongst whom Sir Charles Strickland (at Malton), H. J. Elwes (Cheltenham) and Messrs. Van Tubergen (Haarlem) were prominent, and so also were Messrs. Veitch (Chelsea) and Messrs. Bull (Chelsea). The Royal Botanic Gardens, Kew, and the Austrian Royal Gardens at Schoenbrunn both continued to do inestimable work of the same kind especially among amaryllids whose stature was beyond the economic limits of most growers. Nor must the name of the Messrs. Krelage, to whom the 1938 *Herbertia* is to be dedicated, be omitted from this list, for this was one of the oldest firms of bulb growers in Holland to whose efforts no one can say how much is due. The present Mr. Ernst H. Krelage has kindly sent me extracts from accounts of bulbs furnished by various other firms to E. H. Krelage in or about 1837, and also extracts from bulb catalogs published in Holland about 1837, including the catalog of the Krelage firm. The following list⁸ has been made on the basis of this information and will give some concrete idea of the material generally available during Herbert's time—

Hippeastrum reginae
H. Reginae d'Hollande
H. rutilum crocatum
H. equestre
H. equestre (double)
H. acuminatum
H. reticulatum
H. vittatum
H. vittatum major
H. vittatum rubrum
H. vittatum grandiflorum
H. aulicum
H. braziliense
H. miniatum
H. altissima
H. crocea-vitallina
H. vittelina
H. Krelagii
H. Johnsoni
H. Johnsoni sternianum
H. Johnsoni flore stricta
H. Johnsoni varitaete

Sprekelia formosissima

Sternbergia lutea

Lycoris aurea

Vallota purpurea

Zephyranthes atamasco

Amaryllis belladonna (new)
A. belladonna major
A. belladonna purpurea

Nerine sarniensis
N. undulata

Brunsvigia gigantea

Crinum longifolium album
C. longifolium roseum
C. amabile
C. americanum
C. giganteum
C. augustifolium
C. lineare

Pancratium maritimum

Haemanthus ciliaris
H. coccineus
H. puniceus

Ammocharis falcata

Stenomesson sp.

Hessea crispa

Alstroemeria pelegrina
A. pulchella
A. aurantiaca
A. Ligtu

Polianthes tuberosa fl. pl.

⁸ Nomenclature of the present day is given where there is no question as to the identity; those which cannot be referred to present nomenclature and hybrids are designated as they appear in the 1837 catalogs.

IN RETROSPECT—AMARYLLID CULTURE IN BRITAIN

The culture of exotic amaryllids in Britain has been subject to remarkable changes of taste. Round about 1837 to 1842 a sudden rage for exotic amaryllids broke out. Herbert's great book made its appearance together with the finely illustrated work of Mrs. Bury at Liverpool, of Miss Rosenberg at Bristol, and of Mrs. Loudon in London. At the same time improved methods in the construction and heating of glass houses enabled a host of tender amaryllids to be cultivated. But were they cultivated, or were they merely made the butts of injudicious experiments? One must not be surprised at ignorance, for experience was lacking in the case of bulbs never previously grown or even seen. Even the great Herbert admits the loss of many of his bulbs through attempting to grow them in the wrong soil medium. It is natural therefore that lack of success in the early attempts should put a damper upon the rage for attempting to grow exotic amaryllids.

There is an old Eastern saying—"Art is a thousand men deep"—and to *grow* in heated structures a mixed assortment of amaryllids from various continents and climates demanded a numerous class of trained gardeners. Such a class did not exist then, and is only now being slowly called into being. The first foundation for success had not been provided. No training establishment existed and the gardeners blundered along as best they could. Some successes were obtained; bulbs which contained, when imported, an embryo flower, by some lucky chance carried the inflorescence and were duly figured in various publications. But the great bulk of importations died, or lingered on as wrecks of their former selves. The discouragements encountered led many to give up the culture of exotic amaryllids in Britain by the 80's, but there has never ceased to be a rather limited class of amateur enthusiasts who cultivate these plants in spite of any handicaps. It is important to note in this connection that during the period when exotic amaryllids were being grown to a lesser extent the culture of hardy amaryllids, such as *narcissi* and *galanthus*, increased out of all knowledge in Britain.

A similar course of events has been reported from the United States of North America, but in this vast area the wide range of climatic conditions must dictate what class of plants can be cultivated with success, and in what localities. In the subtropical climate of central and south Florida most of the tender amaryllids are hardy out of doors and many of the earlier introductions which reached there in a round about way, mostly via England and continental Europe, have persisted, especially *Crinum*s, *Lycoris aurea*, *Haemanthus multiflorus*, *Hippeastrum equestre major* and others. In Southern California also many of the tender amaryllids have found a congenial home. While the glass house culture in the north of tender forms declined to a great extent between the 90's and the 1930's, the interest in these lingered on and they were championed by such enthusiasts as Theodore L. Mead and Henry Nehrling in Florida; Fred H. Howard, Richard Diener, Cecil Houdyshel, Gordon Ainsley and E. O. Orpet in California; Al. G. Ulrich in Missouri, and J. L. Gebert in Louisiana. It was natural therefore that the recent

revival of interest in these tender forms should find its beginning in these regions. The revival of interest in tender amaryllids in Australia, South Africa and Kenya should also be noted.

In England economic causes have also operated since the Great War. The load of taxation has dealt severely with the grower of expensive exotics for in many cases he must now limit his purchases to standard types and varieties which can be produced in great quantities and which are in consequence more reasonable in price. These are often excellent for quality cannot be measured in cost. However, this condition has changed the character of the amaryllid grower from an experimenter with varied forms from many parts of the world to a grower of forms that are standardized and which are grown over a wide area in Europe and the United States.

The situation however is not without hope since the recent demonstration that the tender amaryllids can be rapidly propagated vegetatively may lead to a revival in this class, for, with rapid increase, the prices may be much reduced so that tender varieties can be purchased for forcing without the necessity of carrying over the plants from year to year.

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A History of the species of Crocus. 1847.

2. HERBERTIANA:

The Genus Herbertia (Named for Herbert by Sweet).

The Genus Haylockia (Named for one of his gardeners).

Drawings and descriptions of plants contributed to Botanical Magazine, 2121, 2607, etc.

In the Kew Herbarium Library some of Herbert's works are to be found under Hooker, Lindley and Sims correspondence.

Some of Herbert's drawings are at the Royal Horticultural Society (London), and also under Pritzel. 141., Jacks. 558, R.S. C. III. 305.

Biographical notices of Herbert may be consulted in Gard. Chron. June 5, 1847, 371-372 (notice of death); Jour. R. Hort. Soc. II, 249; also II p. 14; The Garden XXVIII. 400; Proc. Manchester Lit. Phil. Soc. XXV. 43; Gentleman's Mag. VI. 531; Dict. Nat. Biog. XXVI. 234 (1847); Ann. Register, 1847 p. 234.

See also misc. non-political articles in Edinburgh Review.

ON CROSSES AND HYBRID INTERMIXTURES IN VEGETABLES¹

THE HON. AND REV. WILLIAM HERBERT

THE first experiments, with a view to ascertain the possibility of producing hybrid vegetables, appears to have been made in Germany, by Kolreuter, who published reports of his proceedings in the Acts of the Petersburg Academy between 50 and 60 years ago. *Lycium*, *digitalis*, *nicotiana*, *datura*, and *lobelia*, were the chief plants with which he worked successfully, and as I have found nothing in his reports to the best of my recollection opposed to my own general observations, it is unnecessary to state more concerning his mules than the fact, that he was the father of such experiments. They do not seem to have been at all followed up by others, or to have attracted the attention of cultivators or botanists as they ought to have done; and nothing else material on the subject has fallen under my notice of earlier date than Mr. Knight's report of his crosses of fruit-trees, and my own of ornamental flowers, in the Transactions of the Horticultural Society of London. Those papers attracted the public notice, and appear to have excited many persons both in this country and abroad to similar experiments.

In the year 1819, having for some years previous paid attention to the production of hybrid vegetables, but ignorant of the experiments of Kolreuter, I was induced, rather against my own inclination, to address some detailed observations on the subject to the Horticultural Society, which were published in the transactions of that body. It was, I say, against my inclination, because I was fully aware, that a much longer course of experiments was necessary, in order to obtain any results sufficiently certain to give stability to my views. It is, however, satisfactory to find at the present day, after the attention of botanists and cultivators has been fully called to the subject during the space of many years, and a multitude of experiments carried on by a variety of persons, that, although our knowledge of its mysteries is still very limited, my general views have been fully verified, and my anticipations confirmed in a manner which I was scarcely sanguine enough to have expected. Soon after the publication of that communication to the Society, I was accosted by more than one botanist in the words, "I do not thank you for your mules," and other expressions of like import, under an impression that the intermixture of species which had been commenced, and was earnestly recommended to cultivators, would confuse the labours of botanists, and force them to work their way through a wilderness of uncertainty; whereas it was evident to myself, that it would on the contrary afford a test whereby the accuracy of their distinctions might be more satisfactorily investigated, many of the errors of their system eradicated, and its details established upon a more solid foundation, and less upon the judgment or caprice of individuals. The alarm, which some botanists had taken inconsiderately, appears to have subsided, and admissions have been already made by some of the most distinguished, which, if the con-

¹ Reprinted from "Amaryllidaceae," 1837, pp. 335-380. References to pages and plates are to "Amaryllidaceae," 1837.—Ed.

sequences that flow from them are considered without prejudice, must lead to much more extensive avowals, and a final assent to the principle of my statements concerning specific and generic distinctions. A number of attempts had been made by the President of the Horticultural Society to produce new varieties of fruit,* by impregnating the flowers with the pollen of other individuals, and the success of his proceedings was communicated to the public, both by his letters to the Society, and by the more substantial production of the fruits he had raised; but it must be evident, that less could be expected in the raising of new fruit-bearing plants by intermixture, because the hybridising process is to a certain degree inimical to fertility in the offspring; and that the flower-garden was more likely to be adorned, than the kitchen-garden replenished, by the intermixture of species. The President adopted in his writings a principle or dogma, which seemed to be then much relied upon by botanists, that the production of a fertile cross was proof direct that the two parents were of the same species, and he assumed as a consequence, that a sterile offspring was nearly conclusive evidence that they were of different species; and this dictum was advanced without suggesting any alteration in the definition of the term species, but leaving it to imply what it had before universally signified in the language of botanists. Having, in fact, the same fundamental opinion, that the production of a fertile intermixture, designated the common origin of the parents, I held also, what experience has since in a great measure confirmed, that the production of any intermixture amongst vegetables, whether fertile or not, gave reason to suspect that the parents were descended from one common stock, and shewed that they were referable to one genus; but that there was no substantial and natural difference between what botanists had called species, and what they had termed varieties; the distinction being merely in degree, and not absolute; so that, without first reforming the terms used in botany, and ascertaining more precisely what was meant by a species, those who argued on the subject were fighting the air; and I suggested, as my view, that the birth of an intermixture afforded presumptive evidence that the parents were of one genus, meaning thereby kind or descent, and implying such an affinity as to enable them to breed together, and to induce a probability that they had diverged from one original created type. The real point in discussion at that period was, whether there did exist a positive and invariable line of fertility or sterility in all mixed vegetable productions, founded upon an original identity or diversity in the parental stocks; and whether it was possible for two plants, which were considered according to the general system of botanists to be distinct species, to produce a fertile cross, without proving an error of the subdivision in that particular case. Further experiments have shewn, that the sterility or fertility of the offspring does not depend upon original diversity of stock; and that, if two species are to be united in a scientific arrangement on account of a fertile issue, the botanist must give up his specific distinctions generally, and entrench himself within the genera. It has been objected that if any plants, now different, had

* There is a paper in the Philos. Transact. concerning the production of apples, by crossing the pollen, by Benj. Cooke.

descended from one original type, we might expect to find new forms and combinations daily arising round us by the process of nature, as well as by artificial agency; whereas the catalogue of European vegetables does not appear to be increased by the production of new plants in a wild* state; but it is most probable, that if the Almighty created the original types capable of permanent variations under different circumstances, perhaps of soil or climate, those variations were worked at a very early period, on the first diffusion of seeds into every different portion of the world, especially by the operation of the flood, and may have in part resulted from the changes of climate which accompanied it and shortened the life of man. We must recollect, that although the different races of dogs, which all freely interbreed, are universally admitted to have come from one type, though now outwardly more unlike to each other than numberless distinct species of other animals, we know not what the similitude of that type was; we have no record concerning the original wild dog, nor whether there existed immediately before or after the deluge any dogs in an undomesticated state; nor have we any knowledge of the time or place when any one of the several races, as greyhound, terrier, spaniel, bull-dog, &c. took its birth; nor is there a single known instance of two parent dogs of the same race, giving birth to individuals of a new race, or materially dissimilar to themselves, except where they are mongrels, and one of the ancestral types reappears more strongly than the other. Neither have we any information concerning the origin of the different races of mankind, which are as different in appearance as the species of vegetables; we have not seen any new race arise within the period of historical certainty; and whatever we do know concerning them, refers the time of their branching out from the common stock to very remote antiquity, at a period antecedent to or coeval with the dispersion of mankind over the globe. If it had been otherwise, the various races would have been blended, instead of occupying different localities. It is probable that the various races of dogs owe their origin to a very early period; to the days, when the effects arising from change of situation, were first experienced by the several created members of the animal and vegetable kingdom: and it is no more essential to believe that individuals of every one of the present species of fox, or antelope, or finch (many of which are more like to each other than the greyhound is to the terrier, though they do not intermingle), entered with their present respective aspects into the ark, than that all the calceolaries on the mountains of Chili, or all the mezembryanthemums on the wastes of Southern Africa, exhibited their present peculiarities in the days of the patriarch. It was perhaps part of the wise scheme of Providence, for the purpose of peopling the world with the immense diversity of forms that occupy it, to give each created race a disposition to branch into diversities, acquiring constitutional peculiarities, which should keep them more or less separated; and the same phænomenon is observable in the languages of man, which are infinitely numerous; yet there

* *Ranunculus*, *Anemone*, *Hypericum*, *Scleranthus*, *Drosera*, *Potentilla*, *Geum*, *Medicago*, *Galium*, *Centaurea*, *Stachys*, *Rhinanthus*, *Digitalis*, *Verbascum*, *Gentiana*, *Mentha*, *Quercus*, *Salix*, and *Narcissus*, are however a long list of Genera enumerated by Schiede, 1825, and Lasch Linn., 1829, as having produced spontaneous hybrids, to which *Crinum* may be added.

is no reason to believe that many languages were given to man on the confusion of tongues; on the contrary, the cloven tongues that gave back the power of universal speech, imply that they were few; but from these have branched out innumerable languages, which cannot be reunited, and no person can show when or how any one of them arose, though we may trace the mingling of one with another in the later years of the world. One thing seems pretty certain, amongst the mysteries in which this subject is enveloped, that the differences worked, whether in plants or animals, in a state of domesticity, do not effect so great a constitutional separation inducing an indisposition to reunite and produce a prolific offspring, as the changes which have been wrought by nature in the wilderness.

I have said in the preliminary observations on *Amaryllidacæ*, that a perfect analogy between animals and vegetables in their generations is not apparent; but I do not mean to assert, that, if this subject can ever be thoroughly bottomed, it may not be found to exist. A reformation of Zoology is in progress; for example, in Ornithology, the Linnean genus *Motacilla* was after a time confined to the wagtails, a large group being detached as *Silviæ*, but later observers found that group to consist of several families, and have since correctly distinguished at least the robins, the redstarts, the nightingales, the hedge warblers, the fruit-eating warblers, the sedge warblers, the chats, the troglodyte wrens, and the greenish wrens, as separate genera with their respective diversities; and within those generic limits I suspect that the power of crossing may be confined, and their several species, however now immutably distinct, may have respectively branched out from one stock since the period of the deluge. I have lately had under my observation a dog, whose father was a fox in an innyard at Ripon, and it has singularly the manners as well as the voice of a fox, but it is the parent of many families of puppies: and I feel satisfied that the fox and the dog are of one origin, and suspect the wolf and jackall to be of the same; nor could I ever contemplate the black line down the back of a dun pony without entertaining a suspicion that the horse, unknown in a wild state except where it has escaped from domesticity, may be a magnificent improvement of the wild ass in the very earliest age of the world: bearing in mind, that both in the animal and vegetable creation, the diversities arising from inscrutable causes in the wild races of the forest, are of a more unalterable character than those which spring up under the care and cultivation of man. With respect to animals in their wild state, their union with their own species seems to be mainly guided by voice and smell, and in domesticity that instinctive preference is evidently much weaker, and the will to keep themselves distinct is therefore lessened. The various species of greenish wrens are so similar in plumage, that it requires nice examination to distinguish them, yet they have different notes, manners, and habits of building their nests, even when in the same locality; but we have no certainty that if their predilection for the voice and smell of their own race was weakened, they would not be capable of producing a fertile cross; and we draw our conclusions from a few instances of domestic

mules between species which happen to be widely removed from each other, as the pheasant and fowl, the goldfinch and canary bird; whereas we should apply to this subject, concerning which our knowledge is very limited, the consideration of the fact ascertained concerning vegetables, which have no will to interfere with our experiments, that some crosses are sterile and some quite fertile, without any apparent reason, except the greater or less approximation of constitution in the parents: and that the cross-bred plant, which has seemed for a long course of years to be absolutely sterile, becomes under some circumstances productive.

In accordance with the principle above stated, when it was shown that the botanic subdivisions of *Rhododendron*, *Azalea*, and *Rhodora*, comprehended plants which were capable of intermixing, I asserted that the botanist must reconsider and alter his subdivisions, and acknowledge that, notwithstanding their peculiarities, they constituted but one genus or kind. Conformably with this suggestion, Mr. Sweet, in the second edition of his *Hortus Britannicus*, has since wisely added to *Rhododendron* the genera *Rhodora* and *Azalea*, with the exception of *Azalea procumbens*, though in his subdivision of the pelargoniums he has not kept in view sufficiently that certain and unalterable guide. The true meaning of species, not as the word used to be explained by botanists, but as it is in fact used in all botanical arrangements, appears to be, the subdivision of the genera or kinds into branches, which naturally maintain themselves distinct even when approximated, though they may be more or less capable of artificial or accidental intermixture; while a local variety will reproduce itself when isolated under particular circumstances of soil and climate; and a seminal variety will not with equal certainty reproduce itself in the same form anywhere, being more ready to intermingle with others of like origin. In fact, there is no real or natural line of difference between species and permanent or descendible variety, as the terms have been applied by all botanists; nor do there exist any features on which reliance can be placed to pronounce whether two plants are distinguishable as species or varieties. Any person, who attends to the subject, will perceive that no botanist has laid down any precise rules by which that point of inquiry can be solved, and that the most variable, contradictory, and unsubstantial features have been taken by different persons, and by the same person on different occasions, to uphold the distinctions they proposed to establish; the truth being that such distinctions are quite arbitrary, and that, if two plants are found capable of interbreeding, when approached by the hand of man, they are as much one as if they were made to intermix more readily and frequently by the mere agency of the wind, or assiduity of insects; and are not separable with more truth by any positive difference, than the varieties which cannot be prevented from crossing with each other when in the same vicinity. It remained to be ascertained whether there did exist a real, natural, and indefeasible difference between plants which could produce a fertile and those which could produce only a sterile offspring by blending their races. It was my opinion that fertility depended much upon circumstances of climate, soil, and situation, and that there did not exist any

decided line of absolute sterility in hybrid vegetables, though from reasons, which I did not pretend to be able to develop, but undoubtedly depending upon certain affinities either of structure or constitution, there was a greater disposition to fertility in some than in others. Subsequent experiments have confirmed this view to such a degree as to make it almost certain that the fertility of the hybrid or mixed offspring depends more upon the constitutional than the closer botanical affinities of the parents. The most striking and unanswerable proof of this fact was afforded by the genus *Crinum*, which is spread round the whole belt of the globe, within the tropics and within a certain distance from them, under a great variety of circumstances affecting the constitution of individuals, which nevertheless readily intermix, when brought together by human agency. The plant called *Crinum Capense* (formerly *Amaryllis longifolia*), impregnated by either *Crinum Zeylanicum* or *scabrum*, both at that time also called *Amaryllis*, produced offspring, which during sixteen years proved sterile, probably because, notwithstanding their botanical affinity, the first is an extra-tropical aquatic plant, and the two latter tropical plants which affect drier habitations and readily rot, at least in this climate, in a wet situation. The same *C. Capense*, impregnated by *Crinum pedunculatum*, *canaliculatum*, or *defixum*, produces a fertile cross, though they are so dissimilar as to have been placed in different genera, and the author was formerly reproached by botanists as having committed an absurdity when he insisted upon uniting them. The reason of the fertility of their joint produce seems to be, that they are all aquatic or swamp plants; and it may be further observed that the crosses with the two former, the plants being all extra-tropical, are much more fertile than that between *C. Capense* and *defixum*, because the latter is a tropical plant. The mules between *Scabrum* and *Capense* having continued so many years with every appearance of absolute sterility, without any change of situation or treatment, at last produced one good seed in 1834 and another in 1835. These facts were of such an overbearing nature, that it became impossible for those, who had charged the author with absurdity for uniting the parents under the genus *Crinum* (to which even certain other plants were then asserted to be more nearly allied than the species at that time called *Amaryllis*), to contend any longer that they, producing a fertile offspring, were of different genera, and they will probably be never again disunited in any botanical work; but the facts furnish much ground for the serious consideration of men of science. It happens (as if expressly designed to overthrow the theory, that the identity of species is proved by fertility or sterility in the mixed issue), that, while *C. Capense*, *Zeylanicum*, and *scabrum*, are very similar in their general appearance, and yield an offspring which has been found quite sterile except in the case of the two seeds above mentioned, *C. Capense* and *pedunculatum* are as unlike as perhaps any two species of any known genus; and if it were asserted that *C. Capense* and *pedunculatum* are one species, and *C. Capense* and *scabrum* two species, the assertion would appear, to any person looking at the plants, too preposterous to require a serious answer.

In further confirmation of the fact that the sterility depends on constitutional discrepancy, or difference of what medical men call idiosyncrasy, may be adduced the curious plant figured in the Botanical Magazine under the name of *Crinum submersum*, which was found by my collector in a pond or flooded spot not far from Rio Janeiro, in company with a small variety of *C. erubescens*, and appeared to be exactly intermediate between that aquatic plant and *C. scabrum*, which grows on high ground amongst the woods. It is absolutely sterile, the anthers being always shrivelled and the pollen dry, and it is not materially different from the mules raised in our stoves between *C. scabrum* and a larger variety of *C. erubescens*, the latter being of course a finer mule, but with exactly the same barrenness of the anthers. *C. submersum* is certainly a natural cross, in consequence of the pollen of *C. scabrum* having been brought to the lake by some humming-bird or insect which touched the stigma of the aquatic species. The same sterility has been found in *C. amabile* and *C. augustum*, which are undoubtedly mules accidentally produced between dry-land and swamp-species, the former probably between *C. Zeylanicum* and *procerum*, the latter between *C. Zeylanicum* and *bracteatum*; as also *C. longiflorum* (*Amaryllis longiflora* of the Botanical Register), which is an accidental cross between *C. Capense* and *erubescens*, one variety of it having been produced at Demerara, the other in Jamaica. The fact being established with respect to one genus, that the species which have most botanical affinity and general likeness, if they delight in a different state of soil or of atmosphere, produce a barren cross, while the most dissimilar, if they possess the same constitutional predilections, give birth to a fertile plant, cannot remain as an isolated circumstance, but must be considered by every unprejudiced and philosophical mind with reference to the whole vegetable creation. I have lately heard it admitted in conversation by an eminent botanist, that he had almost arrived at the conviction that there was but one rose, meaning that there seemed to be no natural impediment to the fertile intercourse of the great variety of plants which constitute the known species of that extensive genus. Let it be observed, if the fact is so, the reason is apparent enough; that, although some roses will endure a little more cold than others, there is a sameness of constitution throughout the genus, which affects a dry soil and a temperate atmosphere. The genus *Calceolaria* embraces plants very dissimilar to the eye of the botanist, as well as of the unlearned observer, of which some are absolutely stemless, and bear only leaves and flower-stalks, while others are shrubby, and acquire a strong woody stem some feet in height; yet there appears to be no limit whatsoever to their intermixture, and their produce may be crossed again indefinitely. Are we, then, to come to the result that there is but one *Calceolaria*, oversetting not only the nicer distinctions of botanical science, but the difference between herb and shrub? The African *Gladioli*, excepting those which, like the European, present their flowers in front of the stalk, have been intermixed by me without any difficulty occurring, and the crosses of the most dissimilar have proved abundantly fertile, and four or five sorts have been blended in successive generations. Some of the complicated crosses have produced seed

less freely, and one treble cross (Hirsuto-Cardinali-blandus) has as yet produced none that has vegetated, probably because the last male, *G. hirsutus*, is of a constitution much less suited to our climate than the other two. Are we then to come to the result, that these dissimilar species are all one natural *Gladiolus*? There is no outward sign of barrenness in *G. hirsuto-Cardinali-blandus*, which will probably bear seed under favorable circumstances; that there is no insurmountable natural impediment may be proved thus; the offspring of *G. versicolor* by *hirsutus*, of *blandus* by *versicolor*, and of *Cardinali-blandus* by *tristis*, have all borne seed, shewing that *G. hirsutus* is not of a separate race, and that the triple cross is not an impediment. I have crosses raised by me between the yellow *Linaria genistifolia* and the purple *purpurea*, and also between *Penstemon angustifolium* and *pulchellum*, both perfectly fertile and sowing themselves about the garden, and, from my having given them many years ago to more than one nurseryman, become common. It is scarcely possible to assert that these very unlike plants are respectively one, and at the same time to distinguish them from the rest of their own genera, especially the former. That whole portion of *Amaryllideæ* which constitutes the genus *Hippeastrum*, and was confounded by botanists with a portion of the genus *Crinum*, not only interbreed freely, but produce offspring invariably fertile, because they are all of like constitution, and impatient of excessive moisture, though some will bear more cold than others. Amongst the *Pelargoniums* a similar convertibility has been found to exist within certain limits, which, if duly observed, will be sure guides to ascertain the genera, into which they ought to be subdivided, and by which the botanist, who is desirous that his labours should not be overturned hereafter, must be in a great measure ruled in classing them. Amongst the *Cacti* or *Cerei* the prickly angular *speciosissimus*, the flexible *flagelliformis* or whip-plant, and the flat unarmed *phyllanthocides*, are nearly the most dissimilar, yet they have produced mixed offspring, which readily bears eatable fruit of intermediate appearance, colour, and flavour. The fruit of the *speciosissimus* is large, green, and well-flavoured, round oblong; that of *phyllanthocides* small, purple, and very inferior; the mule from the former has purple fruit of a medium size and taste. The cross from the former by *flagelliformis* is now ripening here a short angular fruit, quite unlike that of the mother plant. The fertility of these crosses, and readiness to vary the appearance and taste of the fruit, though derived from such very dissimilar parents, is one of the most striking results of our experiments. I have had no opportunity of attempting to cross them with the plants called *echino-cacti*, but I do not see a single point in the generic character given of those plants which can uphold it, and I believe them to be of one genus with *Cereus*, and capable of intermixing; but I have had no opportunity of examining the flower of any of the plants called *Echinocactus* myself. Amongst melons I have had the *Cucumis osmocarpus* from Mexico, bearing a small egg-shaped white fruit and a small flower and leaf, very different from the *Cucumis melo*, fertilized accidentally by its pollen, thus occasionally producing fruit of twice

the natural size with red flesh. *Lobelia speciosa* is a cross between *L. siphylitica* and *fulgens*, yet it reproduces itself abundantly.

The more these facts are considered, and the more they are multiplied, as they will be by the daily experiments of cultivators in other genera, the more strongly will my original suggestions impress themselves upon every botanist, who will look on the subject without prejudice, that the genera of plants are the real natural divisions; that no plants which interbreed can belong to separate genera; that any arrangement, which shall have parted such plants, must be revised; that any discrimination between species and permanent varieties of plants is artificial, capricious, and insignificant; that the question which is perpetually agitated, whether such a wild plant is a new species or a variety of a known species, is waste of intellect on a point which is capable of no precise definition, and that the only thing to be decided by the botanist in such cases is whether the plant is other than an accidental seedling, and whether there are features of sufficient dissimilarity to warrant a belief that they will be reproduced, and to make the plant deserve on that account to be distinguished by name amongst its fellows. The effect, therefore, of the system of crossing, as pursued by the cultivator, instead of confusing the labours of the botanist, will be to force him to study the truth, and take care that his arrangement and subdivisions are conformable to the secret laws of nature; and will only confound him when his views shall appear to have been superficial and inaccurate; while on the other hand it will furnish him an irrefragable confirmation when they are based upon reality. To the cultivators of ornamental plants the facility of raising hybrid varieties affords an endless source of interest and amusement. He sees in the several species of each genus that he possesses the materials with which he must work, and he considers in what manner he can blend them to the best advantage, looking to the several gifts in which each excels, whether of hardiness to endure our seasons, of brilliancy in its colours, of delicacy in its markings, of fragrance, or stature, or profusion of blossom, and he may anticipate with tolerable accuracy the probable aspect of the intermediate plant which he is permitted to create; for that term may be figuratively applied to the introduction into the world of a natural form which has probably never before existed in it. In constitution the mixed offspring appears to partake of the habits of both parents; that is to say, it will be less hardy than the one of its parents which bears the greatest exposure, and not so delicate as the other; but if one of the parents is quite hardy and the other not quite able to support our winters, the probability is that the offspring will support them, though it may suffer from a very unusual depression of the thermometer or excess of moisture, which would not destroy its hardier parent. Such is the case with the beautiful mule *Rhododendron Altaclaræ*, of which the mother was a cross between *Ponticum* and *Catawbiense*, and the father the Nepal scarlet *arboreum*. We now possess a further cross by the impregnation of *Altaclaræ* by *arboreum*, which will probably come so near the father in its colour, that if, as expected, it should be able to endure our winters, we shall have nearly attained the result, which

would be otherwise most likely impracticable, of acclimating the magnificent Nepal plant; for it does not appear that in reality any plant becomes acclimated under our observation, except by crossing with a hardier variety, or by the accidental alteration of constitution in some particular seedling; nor that any period of time does in fact work an alteration in the constitution of an individual plant, so as to make it endure a climate which it was originally unable to bear; and, although we are told that laurels were at first kept in hothouses in this country, it was not that they were less capable of supporting our seasons than at present, but that the cultivators had not made full trial of their powers of endurance. The notion of Mr. Sweet that the roots produced by cuttings are hardier than those of seedling plants is probably fanciful, if he meant permanently so, which alone would be of importance. They may be tougher at the first period of propagation, while the seedling is in its infancy, but that, if not permanent, could have no effect in acclimating a plant. In truth it is not the root that is tougher, but the nucleus or base of the cutting from which the roots issue, and in which the life resides, which is tougher than in a young seedling at the first. All his other experiments only tended to show that some half-hardy plants would live through an English winter in very dry and sheltered situations, or during two or three years, till a more inclement season cut them off, but not that by any process of his they had become hardier; the word acclimating seems, therefore, to have been misapplied in his paper in the Transactions of the Horticultural Society. For the purpose of obtaining a large or a brilliant corolla, it will be probably found in the long run best to use the pollen of the species which excels in those points, because the corolla, in truth, belongs to the male portion of the flower, the anthers being usually either borne upon it, or in some manner connected with it by a membrane; but upon the whole an intermediate appearance may be generally expected, but with a great disposition to sport, especially in the seminal produce of the fertile crosses, as in plants which are apt to break into cultivated varieties.

Before I proceed to consider the various cross-bred productions of late introduction, which at present embellish our collections, I will enter into a short detail of the reports which I have seen of experiments on this subject, made on the Continent, together with my view of the opinions which have been advanced in them, and in a little work by Professor Rennie, the matter of which is chiefly extracted from the writings of Mons. De Candolle. Kolreuter's experiments* are detailed in the transactions of the Petersburg Acad. in 1777, and the five or six following years. I do not find any further reports of experiments made in Germany, previous to that of Gaertner, concerning the observations he had made in 1825, subsequent to the publication of those of the President of the Horticultural Society of London, and of myself, in

* Relating to *Lychnis* and *cucubalus*, N. C. ac. Petr. t. 20. p. 431—448. Hybrid *digitalis* Act. Ac. Petr. 1777. Do. Journ. de physique t. 21. p. 285—299. Other hybrid *digitalis*, Act. Ac. Petr. 1778. Continuation of experiments on hybrid fox-gloves, J. de phys. t. 21. 209—306. Hybrid *lobeliæ*, Act. Ac. Petr. 1777.—J. de phys. t. 23. 100—105. Hybrid *lycia*, Act. Ac. Petr. 1778. *Verbasca*, 1781. *Daturæ*, 1781. Malvaceous plants, 1782. Flaxes, Nov. Act. A. P. t. 1. 339—346. Pinks, ib. t. 3. 177—284. There may perhaps be some other reports by Kolreuter, of which I may have neglected to make a memorandum. I believe one concerning *Nicotiana*.

its Transactions. He gave an account of the number of impregnations he attempted to effect, the particular subjects of his several experiments, and the failure or success of each. I cannot learn that he has since published any report of the germination of the seeds which he had obtained by those experiments, and no later statement was known to Mons. De Candolle, in 1832. I have no hesitation in saying that this report, which seems to have been accepted as proof of what Gaertner had done, is utterly fallacious. He has entirely overlooked the difficulty, and, in many cases, the impracticability with the utmost care of excluding the natural pollen; the insufficiency of a bag to shut it out, and the probability of its having been admitted even before the bag was placed over the flower. I have learned by endless disappointments to know, that no attempt to obtain a cross-bred plant can be looked upon as successful, till the seedlings raised shall have advanced in growth sufficiently to exhibit the type of both parents united in themselves; and I consider Gaertner's report of the cross-bred seeds he *has obtained*, to be nothing but a mere enumeration of the crosses he *has tried to obtain*; and I believe some of his supposed intermixtures to be impossible. The fact is, that in this country, where the passion for horticulture is great, and the attempts to produce hybrid intermixtures have been very extensive during the last fifteen years, not one truly bigeneric mule has been seen; and, although I by no means presume to assert that such a production is impossible, experience shews it to be improbable; and those, who fancy they have obtained one, must forgive my wishing to see it forthcoming, and to examine whether it is certainly of such descent as they suppose. Gaertner details his mode of proceeding, which is pretty similar to my own; but he does not seem aware, that, in spite of all possible precautions, the pollen will often escape unobserved, and will penetrate the coverings that may be used. He asserts that the moist juice of the pollen combines with that of the stigma, to fecundate the germen, a questionable point, that need not here be considered. The superabundant viscous juice on the stigma of *Rhododendron* appears to me to obstruct the fecundation, which I think takes place more readily when it subsides. Gaertner could not decide whether the fecundation is slow as Kolreuter imagined, or rapid as Hedwig asserted; but in microscopical observations the particles of pollen seemed not to be emptied in less than an hour and a half; and he found that, when the fecundation was as he thought complete, the particles afterwards superadded did not change form or color; but that in hybridizing applications a greater quantity of pollen seemed requisite, in proportion to the distance of affinity, and that it was repeatedly consumed; and he fancied that its successive applications in such cases made the seeds more numerous and perfect, which is very probable; but he says that only in kinds very closely allied did he obtain the full complement of seeds, as for instance in the genus *Datura*, of which Metel and Lævis mix freely. He found the life of the stigma more prolonged, when it was not fertilized by its own pollen; which might be expected, because the complete saturation of the stigma had not taken place, after which it no longer receives the influence of the pollen.

He states that in natural fecundations the change of the stigma took place sometimes in 85 or 100 minutes, usually in a few hours, at most in 24; but neither he nor any other person seems to have thought of ascertaining whether the influence of the pollen really fertilizes the germen within that period, or merely saturates the stigma; and, although I have not pursued a course of experiments to make that fact sure, I have some reason to believe that the truth is not yet ascertained. If the fertilization was complete, and the office of the stigma defunct, it might be cut off without any detriment; unless necessary to the mere nourishment of the ovules, whether fertilized or not, which does not seem probable; but I have repeatedly cut it off a few days after I had applied pollen to *Rhododendron*, and the result has been that no seed has been formed. The whole of my observations has led me to think, that at any period before the decay of the stigma the access of the natural pollen may supersede the influence of the foreign that may have been previously applied, if not from a closely allied species or variety; but that on the other hand no foreign pollen can act upon the germen after the stigma has been fertilized naturally. The incomplete saturation of the stigma in the first case enables the natural pollen to gain access; but, if the absorption of the pollen first applied causes immediate fecundation, it cannot be explained how the subsequent access of the natural dust should supersede it; and it has seemed to me that the natural pollen could supersede that of an *Azalea* on the stigma of an evergreen *Rhododendron* even after the flower had fallen off. This point, which I have not sufficiently investigated, might be elucidated by cutting off the stigma with portions of the style of various lengths at different periods after the application of pollen, and seeing in what manner the operation interferes with the fructification of the plant. Gaertner thinks it doubtful whether the corolla is essential to the fertilization of the stigma; my observation is, that its early destruction is very prejudicial to the growth of the germen and stigma, but that after their development it is not usually essential. He observes that the corolla perishes more quickly and completely after fecundation, and is more persistent and sometimes withers instead of falling off, in cases of hybrid impregnation, as it does where impregnation is prevented; but he seems not to have distinguished the cases of successful and abortive hybrid impregnation. I observe that he admits that the viscous juice remains on the stigma of *Datura* and *Nicotiana* two or three days after fecundation, which does not exactly agree with his theory, and seems to mark that the stigma has not become quite inoperative. Some days elapse before any other signs of fecundation appear after the fall of the corolla, such as the enlargement of the peduncle, or strengthening of its articulation, and that period seems to him longer in hybrid impregnation, and the interval longer before the seeds are vivified. Both he and Kolreuter observe instances, such as I have found, of false hybrid fecundation, producing an enlargement of the germen, or even seeds with an imperfect embryo or without any. They remarked, that they did not usually obtain the full complement of seeds from a hybrid impregnation, unless the affinity was very close. My own observation

is that this circumstance depends rather on the similarity of constitution, and is by no means universal, for I had a pod from *Crinum Capense* fertilized by *revolutum*, in which every ovule produced a seedling plant, which I never saw to occur in a case of its natural fecundation. He cites from Kolreuter that *Datura metel* and *lævis* have each about 600 seeds in a capsule; he found that a capsule from one of them fertilized by the other contained 640, and in another case 284; but that *Datura lævis* by *Nicotiana rustica* produced only 108 seeds, which were however apparently perfect and provided with an embryo; but I utterly repudiate the probability of that impregnation, of which he has not published the ultimate result. In Gaertner's list, I find *Convolvulus sepium* by *Ipomœa purpurea* (the *Convolvulus major* of nurserymen) 8 experiments failed; the converse 10 failed. *Ipom. purpurea* by *Convolvulus tricolor* 6 failed; 1 successful, which I greatly doubt. *Datura lævis* by *Metel*, 4 failed and 4 succeeded; by *Hyoscyamus* all failed; by *Nicotiana macrophylla* 3 failed; 1 succeeded; by *Nicot. rustica* 1 failed, 1 succeeded. *Datura metel* by *lævis* all succeeded; by *Hyoscyamus* failed; by *Nicot. macoph.* failed. *Glaucium* by *Papaver* failed. I make no doubt that when the seeds vegetated, the supposed crosses of improbable origin manifested themselves to be natural seedlings of the mother plant, or produced by the intrusion of some kindred pollen. Kolreuter raised mules (*Act. Ac. Pet.* 1780) between *Lobelia siphylitica* and *Cardinalis* both ways. He found them fertile by the pollen of either parent, and their pollen fertilized the parents, but he obtained no seed from the mule by its own pollen. *Lobelia speciosa*, or more properly *Lowii*, *Bot. Reg.* 17. 1455, was found in a border where *siphylitica* and *fulgens* grew; it was a mule from *siphylitica*, which seeds freely. That mule, intermediate and purple-flowered like those of Kolreuter, seeded abundantly with me standing in a border between the two parents, but the seedlings with one or two exceptions, did not approximate to either, but reproduced the mule with some variability of colour. Dr. Wiegman, in a tract published in the German language, has given an account of some interesting experiments. By sowing *Allium porrum* and *Cepa* in one bed, and tying the flower-stems together, he obtained plants intermediate between the leek and onion, which were fertile. By tying together *Vicia faba hortensis* (the garden bean) and *Vicia sativa* (the common vetch), he obtained crossbred seed; the seedlings from the bean had flowers more purple, smaller pods and seeds, which when sown again, yielded plants that appeared to him not distinguishable from what he calls the known red-seeded variety. Those from the vetch shewed also a difference of blossom. In 1823 he sowed *Pisum sativum* (the field pea) and *Vicia sativa* (the common vetch) together; the seedlings showed a departure from the natural colour, and yielded grey seeds. From the twining *Phaseolus vulgaris albus*, and *Phaseolus nanus* which does not twine, he obtained crosses; some seedlings of the latter twining, and of the former bent and crooked, but not twining. From *Vicia sativa* (the common vetch) and *ervum lens* (the lentil) he also obtained a fertile cross. If these facts are correct, it is clear that the closely allied genera *Faba*, *pisum*, *vicia*, and *ervum* cannot be up-

held as distinct; but, although it is a very common practice in England to sow peas and tares mixed with beans, I have questioned many intelligent farmers on the subject, and not one had ever heard of any adulteration in the seed in consequence of the mixed cultivation, which, according to Dr. Wiegman's statement, ought to be of constant occurrence in such cases. On the other hand, I have seen cultivated in Yorkshire a plant having the growth of a vigorous field pea (*Pisum*), which produces seeds that no man would hesitate to call beans, and which when boiled have, I understand, more the flavour of beans than of peas; and the plant, though very fertile, has every appearance of being a mixed production between the two. The most extraordinary mule, however, that is asserted to have been produced on the Continent, is a cross between the cabbage and horse-radish, which Monsieur Sageret reports that he has obtained, and that it has produced seed-pods, some of which resemble the short pod or silicula of the *Cochlearia* or horse-radish, and some the long pod or siliqua of the *Brassica* or cabbage. Strange it is, that asserting such a result, he appears quite unaware of its importance, and does not state whether those singular and various pods contained seeds or proved abortive. He does not even state whether the plants so obtained were annual, like the cabbage, or perennial, like the horse-radish, nor does he describe them. I must therefore, without any offence to him, be allowed to consider the actual generation of such a mule questionable, till the mule plants are produced before the public, so that their conformation may be examined to see whether it is agreeable to their supposed origin, or at least their peculiarities accurately detailed, and the impossibility of a mistake rendered manifest. I have, however, always considered the separation of *siliquosæ* and *siliculosæ* to be very unsatisfactory, and have entertained great doubts of the established distinctions amongst *Cruciferae*. In consequence of M. Sageret's statement, I tried in 1835 to impregnate a plant of *Brassica* with the horse-radish, and with the pollen of two or three other genera of *Cruciferae*; but I did not obtain a single seed from at least fifty flowers, on which the experiments were tried, all other flowers being cut off from the plant. I beg to be understood as not denying M. Sageret's assertion, but requiring better proof of the accuracy of a fact so important to science, in which he may be mistaken, and more detailed particulars, and especially the production of the plants; and I invite M. Sageret to communicate one of them to the Horticultural Society of London, that opportunities may be afforded of examining it carefully.

Experiments have also been made on the Continent to establish within what limits the cucurbitaceous plants (melons, &c.), can be intermingled; but, the names used not being of general currency, I cannot state accurately the result. Dr. Wiegman extended his experiments to varieties of oats. The accuracy of his observations and those of Sageret ought to be thoroughly investigated, and the results produced before the public; and a more useful office, connected with its pursuits, could not be undertaken by the Horticultural Society of London, than to pursue those enquiries and extend them to other vegetables. An

observation made by Gaertner and Wiegman (Berlin, 1828) as well as by Mr. Knight, that the offspring of hybrids revert to the maternal and not to the paternal type, is certainly erroneous, and Wiegman admits that tobacco (*Nicotiana*) and oats may be made by crossing again either to revert to that of the mother, or advance to that of the father. The offspring of the mule *Passiflora cœruleâracemosa*, both in Mr. Milne's garden and in mine, have notoriously approximated to the type of the father, and lost altogether the red colour of the original mother. It is certainly not correct as a general law, though some have stated it, that the number of seeds in one pericarp is smaller in hybrid, than in cases of natural, impregnation; it is true in some cases, and the reverse occurs in others. With respect to the conditions stated by Professor Rennie, as necessary to ensure success in crossing vegetables, it must be observed that the first, namely, that the blossoms should be nearly in the same state of advancement, is not accurate; for in some kinds, as for instance, *Calceolaria*, that which is to bear the seed should be much less advanced than that from which the dust is taken; and in others, as *Pelargonium* and *Alstrœmeria*, it should be much more advanced. In truth, the moment should be seized, when the stigma in the flower which is to bear the seed, and the pollen in the other, is in perfection. The second condition stated, that the anthers should be cut out early in the morning, is equally liable to objection, and cannot be applicable to all flowers, some of which blow in the morning, and others in the afternoon or evening. The necessary condition is, that the anthers be removed from the flower that is to produce the seed before the dust can escape from them; for which purpose in many cases, as for instance in *Crocus*, *Erica tetralix*, and others, the flower must be opened with great difficulty at a very early stage. The plant must be then placed in a situation where no natural dust can reach it, brought either by the wind or by insects; and the pollen from another flower, which is in perfection and not beginning to wither, must be applied to the stigma as soon as it is quite developed and mature, or rather sooner. The success of such experiments is always most probable when the plant, which is to be fertilized, has been forced, and no natural pollen can be brought to it accidentally from other plants, and, by forcing one of the intended parents, those, which flower at different seasons, may be made to intermix. But it should be always remembered that, except in cases where the anthers are very accessible, and not mature till after the expansion of the flower, it is almost impossible to be quite certain that no particle shall escape from them in the operation. It is incorrectly stated that we cannot cross plants which do not ripen seeds with us, for their dust may be used to fertilize one that will ripen its seed; for instance, the pollen of *Zephyranthes carinata*, which I have never known to bear seed in England, has fertilized *Z. tubîspatha*. It is also very possible, if the fruit of one species is apt to perish immaturely from the unsuitableness of the climate, and the germen of another is not usually fertilized with us, in consequence of an imperfect formation of its pollen, that it may be effectually fecundated by the pollen of the other species, though neither would have borne seed separately. The deficiency of pollen is of fre-

quent occurrence in the American Azaleas from the fault of our climate; but the pollen of *Sprekelia* and of *Z. carinata* is abundant, and their sterility does not arise from its defect, but from the temperature or exposure in which they are placed not being exactly adapted to the growth of their fruit.

The first hybrid amongst our liliaceous plants that appeared in our gardens was the mule between *Hippeastrum vittatum* and *regium*, which was circulated under the name of *Amaryllis Johnsoni*, having been raised by a nurseryman named Johnson. It was, perhaps, an accidental production, for it was offered to the public with an incorrect statement, that it had been raised by impregnating *H. vittatum* with the pollen of *Sprekelia formosissima*. He might, however, have made various trials, and have been deceived as to which of them had been successful. That statement has been since disproved by the failure of every attempt to fecundate any species of *Hippeastrum* by the pollen of *Sprekelia*, of which the separate generic character is thereby confirmed, and also by the facility with which plants exactly similar have been raised between *H. vittatum* and *regium*. The next hybrid of that order, that flowered amongst us, was the *Crinum Goweni*, which was raised from seed of *C. Capense*, impregnated with the pollen of *C. Zeylanicum* in the greenhouse of the Earl of Carnarvon, at Highclere, in 1813, by R. J. Gowen, Esq., and blossomed in my possession at Spoffroth; and soon after the mules between *C. Capense* and *Canaliculatum*, which had been first raised by me at Mitcham about the same time, came into flower with other crosses at Spoffroth. All the hybrid *Crinums* raised between *Capense* and tropical species, which are now very numerous, are hardy enough to stand out of doors against the front wall of a stove, where, if a mat is thrown over them in sharp frosts, they preserve much of their leaves through the winter, and from May to November continue throwing up a succession of flower-stems in great perfection. *C. scabro-Capense* bears the most beautiful flower; *C. pedunculato-Capense* is of the largest stature. The only other hybrids of much note in our gardens at that period were, to the best of my recollection, as follows:—The *Rhododendron Azaleoides*, obtained by the accidental impregnation of an *Azalea* by *Rhododendron Ponticum*, in the nursery of Mr. Thompson at Mile-End; the *Rhododendron glaucum hybridum* figured in the Botanical Register, and *Azalea enneandra* figured in the Botanical Magazine, which had both been raised by me at Mitcham and removed to Spoffroth. Since that time we have had the *Rhododendron fragrans* of Mr. Chandler, and a very great number of similar crosses from American white *Azaleas* by *Rhododendron Ponticum* at Highclere. I am not aware at what period the beautiful mule pink which is common in our gardens made its first appearance, nor through whom, or in what manner it was obtained; but it was probably the produce of an accidental intermixture of a florist's pink with a crimson sweet-william. Mr. Sweet gives no date to the hybrid pinks. Several most beautiful mule *Gladioli* and *Ericæ*, which had been raised at Mitcham between the years 1808 and 1814, and removed from thence to Spoffroth, had also flowered there, but had not been made known to the public till the year 1819, when an engraving

of *Crinum Goweni* was published in the Horticultural Transactions, and a figure of two or three crosses of *Gladioli* appeared soon after in the same work. Those who raised pelargoniums from seed had found amongst the produce of certain species a great disposition to intermix and sport, which was occasioned by the accidental transmission of the pollen from one plant to another by the bees, which occurs perpetually in that genus, because many of its flowers are occasionally without anthers, or lose them before the stigma comes to maturity, which causes them to be fertilized by another flower; and in the year 1812 (taking the date from Sweet's *Hortus Britannicus*) the beautiful cross between *Pelargonium Citronodorum* and *fulgidum* was obtained from seed, and afterwards produced under the name *ignescens*; and, being fertile, it has become the parent of an innumerable variety of the most beautiful plants that adorn our greenhouses. *P. ardens* had been raised two years before between *fulgidum* and *lobatum*, and had first pointed out to cultivators that it was possible, through the pollen of *P. fulgidum*, to introduce its brilliant tint of scarlet under a variety of modifications, in union with the superior qualities of other species in which it was deficient; but a long course of experiments has shewn the impracticability of blending the plants allied to *zonale* (which are properly detached by Mr. Sweet under the name *Ciconia*) with the true *Pelargoniums*, which are however certainly of one genus with the bulbous rooted sorts that are found to interbreed with them, and have been improperly detached. Such plants as *fulgidum* and *echinatum*, which have a stem of a semi-tuberous nature and capable of enduring a long period of drought, form a curious link between the tuberous and fibrous-rooted species. The practicability of obtaining a cross between the hardy *Passiflora cœrulea* and its more splendid but tenderer congeners had been suggested in my communication to the Horticultural Society; and not long after Mr. Milne verified the suggestion by the production of three fine varieties by seed from the scarlet *racemosa* fertilized by *cœrulea*. These mules, though not absolutely sterile, are indisposed to fruit, but seedlings were obtained from them by Mr. Milne, which are approximated more in colour to the male parent *cœrulea*, and laboured under a suspicion on that account of having been the fruit of a second cross by *cœrulea*, which was flowering in the immediate vicinity. Some time after a solitary fruit was borne by one of Mr. Milne's plants in the conservatory at Spofforth, and although there certainly was a plant of *cœrulea* in another greenhouse in the garden, at a considerable distance from the plant, there was no probability of its pollen having reached the conservatory, though it certainly was possible that it might have done so. Twelve seedlings were raised from the fruit, which was small, shrivelled, and quite deficient in juice, and those which have flowered not only approximated in colour to *cœrulea*, having no tinge of the red of its female progenitor, but were inferior to *cœrulea* in the beauty of the flower, and tenderer than that plant; neither of which circumstances were likely to have occurred, if they had been derived from a second cross with *cœrulea*. In the same manner I have found that the seedlings from the crosses, between the scarlet *G. cardinalis* and the white or purplish *G. blandus*, are always disposed to

degenerate from the colour of the more brilliant parent and approximate themselves to *G. blandus*, whether the scarlet *cardinalis* was the male or the female ancestor. It appears probable that this seeming disposition in fertile crosses to produce seedlings approaching to the least splendid of their parents, may arise from the effects of our climate upon them, which is more congenial to the duller coloured than to the brighter species; in which case it would follow, that if the crosses were planted in the native soil and atmosphere of their more splendid parent, the same degeneration of colour would not take place. This is, however, a conjecture which I have no opportunity of verifying. I was led in some measure to form it, by having once observed the flowers of the hardy *Nymphæa alba* of a pale rose-colour, after a fortnight of unusual and intense heat in July, which appeared to point out why the genus *Nymphæa*, which is white in our latitudes, is found blue nearer the tropics, and red under their influence. This suggestion does not, however, account satisfactorily for the mule offspring, being inferior to the mules themselves generated in a similar situation; but I have observed the seedlings from *Hippeastrum Johnsoni* or *Regio-vittatum* by its own pollen to have often a corolla both smaller and less brilliant than the mule plant itself, and this deterioration of the descendants may perhaps be in part attributable to the fertility of the mule being less vigorous and perfect than that of the original parents, when there exists some constitutional difference between them, which is the case in these three instances, *Passiflora cœrulea* being hardier than *racemosa*, *Hippeastrum vittatum* than *regium*, and *Gladiolus cardinalis* much more thirsty than *blandus*.

I have already spoken of hybrid cactaceous plants of the genus *Cereus*. *Grandiflorus* is also said to have been crossed with *speciosissimus* at Colvill's, and *Ackermannius* has bred with both *phyllanthocides* and *speciosissimus* at Spofforth, and I have been told that some of them have been also crossed with the very dissimilar *truncatus*. There is, therefore, every reason to suppose that the whole genus *Cereus* will intermingle, and the fertility of the existing crosses seems to open an unlimited field to the expectations of the cultivator. I entertain such doubt of the truth of the separation of *Echinocactus* that I would urge cultivators to try whether it will cross with *Cereus*. In no genus, however, are more valuable results to be obtained than in that magnificent ornament of our shrubberies, the *Rhododendron*, including the subordinate family of *Azaleas*, which together with *Rhodora* form part of the same genus. I had entertained an idea that the dwarf Alpine species would be found distinct from the rest of the genus, but I am satisfied the suspicion was unfounded, and I believe all the species to be capable of intermixing, though I have failed as yet in blending *Az. Indica* with any but its own immediate kindred. There is a strong plant at Spofforth from *Rhodora Canadensis* by *Azalea Pontica* (of which cross a great number were raised, but being very delicate when young most of them perished, as well as another cross from *Rhodora* by *Rhododendron Ponticum*), and small plants were raised from *Rhodora* by *Azalea triumphans* and *Rhod. Ponticum*. That by *Az. Pontica* will flower next spring for the first time. Four evergreen seedlings obtained from the seed of *Rhod.*

Ponticum, which I had fertilized at Spofforth with pollen of *Az. Pontica*, have flowered at Highclere. Two produced yellow fragrant flowers nearly of the colour of *Az. Pontica*, one had flowers of a paler yellow or lemon colour, and the fourth of an intermediate chestnut. I have raised many weak plants from the seed of *Rhododendron* by yellow and orange Azaleas, but I have found extreme difficulty in rearing them, and have lost them at an early age. I had the same bad success in trying to rear to maturity a pot full of mules between the white Australian *Nicotiana suaveolens* and the red Virginian *Tabacum*. The American Azaleas have intermixed with the Nepal *Rhododendron aboreum* at Spofforth, and under the care of Mr. Smith of Norbiton, at that time the gardener of the Earl of Liverpool, who also succeeded in obtaining seedlings from *Rhododendron Dauricum sempervirens* by the scarlet *aboreum*. The latter, which were curious little plants, are probably all dead, in consequence of his injudicious perseverance in exposing them at an early age in the open ground. I vainly endeavoured to rescue the last survivor from his hard treatment. It is remarkable that the difference of constitution between the *Rhododendrons* and the American Azaleas seems to render the mules more impatient of wet than either of the parents, which is manifested by a sickly variegation of the leaf, rendering it often difficult to rear them, and indicating the want of a more sandy and drier soil. This may be the consequence of crossing a deciduous with an evergreen species. It is probably on account of that discrepancy that no seed has been yet obtained from any *Rhododendron-Azalea*, though the crosses of evergreen *Rhododendra* are sufficiently fertile, and I have raised seedlings from *Azalea Pontica-viscosa* v. *alba*, and *Calendulacea-viscosa* v. *rubescens*, though neither are disposed to seed freely. The intermixture of the white *Rhododendron maximum*, which is not an accidental variety, but a widely-spread and permanent kind on the mountains of Jersey in America, with *Ponticum*, has afforded a beautiful white cross, which reproduces itself in perfection by seed, and from that, or the American white itself, with *Azalea Pontica* or the yellow *Sinensis*, or the still more splendid orange varieties of *calendulacea*, we may expect to obtain various *Rhododendrons* with more decidedly yellow flowers, hardier constitution, and larger stature than *R. Chrysanthum*. Seedlings from the white American *Rhododendron*, and also from a cross between *Maximum* and *Ponticum*, impregnated by me with pollen from *Az. calendulacea* v. *chrysolectra*, were in cultivation at Highclere, but they have been mislaid and perhaps lost. The fragrance of the Azaleas had been communicated to the *Rhododendron*, both by the Mitcham crosses and that of Mr. Chandler. The Indian Azaleas are probably capable of intermixing with the rest of the genus *Rhododendron*, and the beautiful lilac cross obtained by Mr. Smith abundantly between *phoenicea* and the white or *ledifolia* is very fertile, and has produced a great number of vigorous seedlings at Spofforth. *Rhododendron Ponticum* and *Catawbiense* have produced a cross which far excels the natural sorts in the size and complication of the umbels of flowers, and is amazingly florid, and the further cross *Altaclaræ* between that and the scarlet *aboreum* is of a colour beautiful in the extreme, and quite hardy enough to bear our winters, though more impatient of wet than the

Pontic and American plants, more fragile, and from its inheriting the early habits of arboreum, very obnoxious to spring frosts. A profusion of seedlings, now of large size and flowering, were reared at Highclere from the American blush-coloured aborescent *Rhododendron*, probably the maximum v. *purpureum altissimum* of Pursh, which is more like to *Ponticum* than to *maximum*, and requires a specific name (I suggest *Aborescens*), impregnated by the scarlet aboreum of Nepal, and this cross will probably be of great stature and magnificence. The plants of that American species or local variety have broad oval leaves. I have another permanent variety of American *Rhododendron* raised from seed gathered by Fraser from a tree in Pennsylvania, which he stated to have been the largest he ever saw, and capable of being sawed into large planks. It has the leaf narrower than *Ponticum*, and unlike any of the three kinds which are ranged under the name *maximum*. I should include it under the name *aborescens*. The white Nepal aboreum, with a feruginous underside to the leaf, and the beautiful but still rare *campanulatum*, are hardier than the red aboreum; and Dr. Wallich saw in one situation the red growing at a much higher elevation than it usually occupies, from which hardier variety he has given us hopes of obtaining seed; and from these sources, as well as from the bristly *Rhododendron barbatum*, when it shall flower with us, and the beautiful *Rhododendron venustum* of Silhet, which we hope soon to possess, our means of increasing the varieties of this desirable family will be multiplied. It is to be hoped that the seedlings which I have raised from the white *Rh. maximum* by aboreum, will not move so early in the spring and will suit our variable climate better. An intermixture between the white aboreum and the yellow or orange *Azaleas* will yield a plant of great beauty. The cross between Aboreum and *Caucasicum* has flowered and been duly appreciated. The mule *Altaclaræ* has been crossed again with a large red *Azalea* at Highclere, and *Azalea Sinensis* has yielded a most beautiful intermixture with the same red *Azalea*. The finest flowered cross I have seen is one that I possess between *Arboreum* and *Catawbiense*, and having forced this plant more than one season I have obtained seed from it, no other *Rhododendron* having been in flower at that time. The result is important, namely, that it requires no label to distinguish the offspring, which are as uniform and unlike all others in foliage as if they were a separate species; and so in fact they are, and, if planted by themselves in a congenial situation and climate, would be the parents of a distinct race. This cross I call *Haylocki*. The great complaint against the mules raised by the impregnation of the Nepal aboreum, is that they all partake of its irritability, and move so early that they are very frequently damaged by spring frosts. Finding them all as irritable as the male parent, I have lately raised from it crosses by *R. maximum* and others, hoping that such may inherit the tardier habits of the hardy male parent, which would greatly increase their value. They are as yet but two years old, and their constitution has not yet been sufficiently proved. In the lovely genus *Rosa*, I believe, little has been done except by the hand of accident, and the necessary consequences of cultivation and the approximation of species in gardens. Much re-

mains to be accomplished, but our climate is not very favourable to the seeding of the more delicate sorts, and the continental cultivators do not as yet take pains to obtain the results that might be expected from a judicious combination of the species, when *rosa lutea*, *sulphurea*, and *bicolor* shall be brought into union with the fragrant, the double, and the ever-blowing individuals of other species. The first decided original cross that we know was brought by Fraser from America, where it had been raised between the musk cluster and the ever-blooming Chinese, probably by accident; and, having been sold to Mr. Noisette, it has been made to bear his name, and, being more fertile in France than in this country, it has become the parent of an extensive family of beautiful varieties. From this plant Mr. Smith raised by impregnation with the yellowish Indian rose a variety of some merit, but not a good flowerer under general circumstances; and *Rosa ruga* is understood to have been raised in Italy from the Ayrshire rose by the pollen of the Chinese *odorata*, but the fact is not authenticated, and, if I am rightly informed, the great variety of cultivated roses, is owing rather to accidental than artificial intermixture. It is particularly desirable that those, who reside in quarters congenial to the seeding of roses, should exert themselves to intermix the qualities of the most estimable species. Many have been lately introduced of which I know not the origin. The honeysuckles also offer an easy opportunity of improvement, by intermixing the fragrant and more vigorous with the yellow and the scarlet. Fruit has been grown at Spofforth from the common garden honeysuckle by Fraser's scarlet, but it was plundered, when on the point of ripening, by robins. I have plants which I have raised from an early pale honeysuckle crossed with *hirsutum*, and with *flavum*. The French have favoured us with some desirable magnolias from M. Yulan, fertilized by *obovata* and *gracilis*, but the admixture of the Chinese species with the magnificent *grandiflora*, and with the very hardy *tripetala* is probably still in expectation. One of the most interesting genera, on which the process of intermixture has been successfully attempted, is that of *Calceolaria*, because it embraces plants of a decidedly shrubby and tender habit, and others which are completely stemless, and capable of retiring to rest under ground in the temperature of a British winter, and colours very dissimilar, the yellow and the brownish purple; and because most of the numerous species which have been imported appear to intermix with the greatest readiness, producing an endless variety of forms. The natural effect of crossing a yellow with a purple flower should be to produce various shades passing from the intermediate coppery tinge to the two extremities of purple and yellow, and such is the case in the mixtures between *arachnoeides* and the different varieties of *integrifolia*; but the cultivators of this genus were surprised by the breaking of the intermixture of the purple *arachnoeides* with *Corymbosa*, which has some purple specks on the corolla, so as to produce yellow flowers, broadly blotched with dark and even blackish purple; but the subsequent discovery of a Chilean biennial species which has not yet been figured, and which I call *C. discolor*, blotched with a reddish purple in a manner somewhat similar, shewed that such an arrangement of colour was a

natural variation of the genus, which the cultivator might therefore have expected, if all the natural species thereof had been previously brought to his knowledge. *C. integrifolia* in all its varieties, including the closely allied *viscosa*, is a woody shrub, attaining, if protected, the height of several feet (I have had *viscosa* ten feet high), but incapable of resisting many degrees of frost, while *C. plantaginea* is absolutely stemless, and so hardy, that although it loses its leaves in the open border, and disappears in the winter out of doors, yet even in the north of England it pushes again in the spring, and is only liable to be lost by drought in summer, or too great a superabundance of wet in the winter season. The application of the pollen of the latter to the shrubby *integrifolia* at once reduces the stature of the offspring from that of a shrub to a low semiherbaceous plant, not absolutely stemless, yet capable of retiring into winter quarters like *C. plantaginea*, and not exceeding a few inches in elevation. *C. Herbertiana*, though shrubby, has more affinity to the herbaceous species, being rather intermediate between *integrifolia* and *corymbosa* in its general appearance, and the effect of the application of its dust to *C. plantaginea* is to afford an offspring more absolutely herbaceous, and of which the leaves are partly radical and partly borne on recumbent sprouts. The same is the case with the cross between *C. plantaginea* and *arachnoeides*, which, though it pushes out a number of herbaceous branches, that die back in the winter out of doors, is perfectly hardy and spreads under ground, so as to form a large clump. The cross from *C. plantaginea* by *rugosa* (figured in the Botanical Register first under the name *ascendens* which is to be struck out, and afterwards a second time under the right name *rugosa*) grows but a few inches high, and is marvellously florid. It is further remarkable, that although the natural species in this genus have such diversity of habits, the crosses, as far as has been seen, are all fertile and able to intermix, ad infinitum, though they will not bear seed as readily as some of the natural sorts. Unfortunately *C. corymbosa* which has given us a cross with the most beautiful broken colours by intermixture with *arachnoeides*, called *C. Youngi*, from the nurseryman who first flowered it, is one of the most delicate species that have been introduced. *C. plantaginea* is covered with minute specks underneath, and the cross between it and *arachnoeides* is inclined to continue speckled, and not to receive the ornamental blotch, but to change the whole tint of the corolla. The cross of *plantaginea* with the annual *crenatiflora* is a hardy biennial one, but it has perished with me after flowering. *C. floribunda*, which endures a Yorkshire winter, may afford the means of elevating a conspicuous branching scape from an herbaceous stemless plant, and produce some very desirable crosses with species that have a more ornamental flower. One very singular monstrosity has shewn itself, though not permanently, yet frequently amongst the mules from *C. plantaginea*; the flower has assumed a form totally different from its natural shape, being like a bag or purse two inches long, widest in the middle, and gradually tapering almost to a point at the two extremities. Sometimes one or two such are on a stalk amongst the natural flowers, and sometimes nearly a whole head has consisted of them. This may authorize an expectation of very

curious garden varieties being hereafter produced in this genus. The whole genus agrees in constitution, liking a clear air, and a very moist soil. The hybrid *Gladioli*, of which a large portion are sufficiently hardy, flower about the same time as the roses, and contribute quite as much in general effect to the embellishment of the garden by their fine colours and profusion of blossom. They succeed very well in the natural soil of the garden at Spofforth, which is a good yellowish light loam, suitable for barley, and also in the artificial borders of peat and sand, where, however, in a dry summer they stand more in need of water. These hardy crosses are between *G. Cardinalis*, *blandus*, *carneus*, *inflatus*, *angustus*, and *tristis*, and they vary with every shade of colour from white to scarlet, rose, coppery, and blackish purple, and some are exquisitely speckled in consequence of the cross with *tristis*. They succeed best when grown into a thick tuft, in which state the profusion of blossom is admirable, the cluster of bulbs and the old skins of decayed bulbs permitting the wet to drain away, and preventing the earth from lying too close and heavy on the bulbs in autumn and winter. Clusters have now stood undisturbed at Spofforth above twenty years, with the precaution of covering them with leaves from November to March or April. There is danger in disturbing and parting them, for numbers will rot if re-set separately; and, if they must be divided, it is best to do so in April, or, if it be done in the autumn, the roots taken up should be potted, and turned out again in the spring. The beautiful crosses with *hirsutus*, *recurvus*, and *versicolor* are more delicate plants, and do not succeed well in the border. I have not succeeded in obtaining any cross, on the correctness of which I can depend, by admixture with *Gladiolus psittacinus* (*Nathalensis*), and I do not believe that it will breed with any of the above. Like all the European species, it presents its flowers in front of the stem, which is erect; and repeated experiments have shewn that every flower of *G. tristis* which was touched with the pollen of *G. Byzantinus* only, failed of making seed, while every flower to which the natural pollen had access produced it, and I consider the union of *Byzantinus* with any of the species above enumerated, except *Psittacinus*, to be impracticable. I consider *Alatus* to belong to the same family as *Psittacinus*, and also a beautiful species imported, likewise, as I understood, from the neighbourhood of the Nathal river, which I propose to call *G. oppositiflorus*. It is now sold by the Dutch nurserymen under the name *floribundus*, which has been long preoccupied. Its flowers, twenty-four or more in number, present themselves alternately from the two sides of a robust erect stalk. *Blandus*, *Cardinalis*, &c. have the flowers rising upwards from the back of a bent stalk, and seem to constitute a family distinct from those which present themselves in front. *G. oppositiflorus* has the flower much undulated, white, dashed with pinkish purple. The genus *Gladiolus* ought to be divided into at least two sections or sub-genera. I consider a sub-genus to be such a portion of any genus as will not intermingle with the rest, and has some distinctive appearance, but insufficient to induce a belief of their original diversity. Seedling *Gladioli* will flower often the first autumn; the best treatment is to sow the seed in pots, and give them shelter till the seed-

lings are pretty strong, and then turn out the ball unbroken into the border, where they will produce a crowded nosegay of flowers of various shades of colour.

It is not, however, by crossing different species or local varieties of plants only, that the cultivator may add to the beauty of his collection. Much may be done undoubtedly by crossing judiciously the finest seminal varieties of such plants as have been already improved in our gardens, and are disposed to break into a multiplicity of forms or colours.

It is to be observed, that in some cases the seminal varieties of plants preserve themselves almost as distinct in their generations as if they were separate species: for instance, the cultivated double holyoaks, of which at least the orange, the yellow, the white, the black, the red, and the pink, may be raised with certainty by seed from plants of the several colours, although planted near together in the garden; and it is probable that if gardeners were to take the trouble of crossing them with the pollen of plants of a different colour, a greater multiplicity of hues would be procured. In carnations also the seedlings have a great disposition to follow the colour of the parent plant. I have had greater success than any other person in raising from seed double camellias of various tints and appearance, and some of the best have been produced either from single flowers or plants raised from single ones, impregnated by the pollen of double flowers, preferring, where it can be got, the pollen that is borne on a petal. The new seedlings that flowered with me in one spring for the first time were nine full double; three semidouble, of which one was very fine, and only three single; but such an unusual result is not to be obtained without particular attention to the mode of treating the mother plant while in flower and seeding: the method which I have adopted being to keep it in confined air, with a superabundance of water, even to the detriment of its health, and to prevent it from making young shoots, in a great measure, if not entirely, by which means an exuberant degree of nutriment is forced to the seed vessel. The reason that the seedlings raised by some nurserymen are so very inferior is, that their plants are in the most luxuriant growth; and it cannot be expected that seed gathered from individuals growing with freedom and vigour, should not be more disposed to reproduce the natural form of the plant, than to yield the fine cultivated varieties, which are to be obtained from them when almost diseased by repletion. The finest double varieties of *Camellia Japonica* which I have so raised are as follows:—

From the single white by the pollen of the Pompone, 1. var. *Spofforthiæ*, or *Spofforth striped*, very large and very double, white, with a few pink stripes, and occasionally one or two anthers.—2. v. *Maculosa*, or *Calypso*, do.—3. v. *Haylocki*, or *Haylock's white*; pure white, rarely a few anthers.—4. v. *Ebúrnea*, or *Ebur*; very vigorous, pure white; somewhat waratah shaped.—5. v. *Nivosa*, or *Nitor*; double white, variable in form.—6. v. *Fortuita*, or *Fortúna*; very like var. 1.—7. v. *Lactescens*, or *Luna*; double white. From seedlings impregnated by the Pompone, which had been raised from the common single red by the striped.—8. v. *Púmila*, or *Circe*; regularly formed double white dwarf myrtle-leaved.—9. v. *Ulantha*, or *Hylas*; white striped with pink; flowers in four uni-

form compartments.—10. v. *Lysantha*, or *Lysimachus*; flowers if possible more regular than the buff or old double white, red with a watery white line and margin to each petal. A very erect plant of rapid growth with flowers of first-rate merit.—11. v. *Victric*, or *Victoria*; own sister to *Lysimachus*, equally regular, of the colour of a full-blown cabbage rose, paler near the edges. From the Chinese semidouble by *Pompone*.—12. v. *Picta*, or *Alcméne*; very regular in general; with a pink stripe usually on each petal, the white changing after some days to blush, sometimes less regular, with one or two anthers; very beautiful. From the *Pompone*.—13. v. *Spofforthiana rosea*, or *Idúna*; superior to the Peony-flowered in form and colour; the flower has always some anthers like its parent. From the waratah by the striped.—14. v. *Foliolósa*, or *Amalthéa*; flower-shaped like the rose-scented peonia *edulis*, v. *rosea*, red, with about 350 petals.—15. v. *Conferta*, or *Odin*; fine double red, not regular. I have never seen any anthers in either this or the preceding.—16. v. *Porrecta*, or *Bellóna*; fine crimson; branches horizontal or weeping. From waratah by *Pompone*.—17. v. *Modesta*, or *Hebe*; flower nearly regular, of a delicate purplish pink. From waratah by 13. *Iduna*.—18. v. *Rosígena*, or *Penélope*; double red. From a seedling from single red by striped, fecundated again by striped.—19. v. *Molesta*, or *Némesis*; very double red, but a delicate plant.—20. v. *Venósa*, or *Venus*; flower regular, but not sufficiently full, red veined with white. This has produced but one flower yet, and I am not sure of its permanent superiority. Many others of much merit I have not thought worthy of being named; and amongst them is one full-double red, raised immediately from the common small-flowered single red. I have a great multitude of seedlings which have not flowered yet, from which I anticipate much beauty and variety. I scarcely entertain a doubt that the double pink *Camellia Sesanqua* (*Maliformis* of Lindley) is a cross-bred plant between *C. Japonica* and *Sesanqua*; and, from its seeming sterility, I cannot but suspect that *C. reticulata* is not a genuine species, but a cross, perhaps obtained from some species still unknown to us.

Mr. Chandler obtained some very fine varieties from the waratah, impregnated by the striped, one season, but those which he has raised since have not proved good. It is, therefore, probable that there was some difference in the treatment of the plant or plants which bore seed for him that season, though accidental and unnoticed by him. His finest productions are *eximia*, somewhat like *imbricata*, *Bironi*, one-while called *concinna*, a very remarkable flower, regular and oddly flattened, but very beautiful; *Woodsi*, a large rose-coloured flower, quite double, but cup-shaped and hollow in the centre, requiring a little warmth to flower it in perfection; *Chandleri*, striped, sometimes very fine, but not always equally so. His *élegans*, *rosa sinensis*, and *flórida*, are handsome also; *corallína* and *althæiflora* sometimes, but often producing poor semi-double flowers. His *anemoneflora alba* comes very near in flower to its parent the *Pompone*, with a much less hardy constitution. Mr. Gray produced three cross-bred seedlings, of which Press's *eclipse* is the best, and Colvill's nursery two speckled seedlings of considerable merit, though very irregular, and too muddy in the colour. I have seen no

other seedling *Camellia* that deserves to be preserved, but I have been told that Mr. Gray has since raised a good red one. His former plants were said to have been crosses between the single white and Chinese semi-double. These observations may perhaps tend to the raising still finer varieties, when the mode of obtaining them is rightly understood. I have no difficulty in obtaining seed from any given flower of the Pom-pone or Middlemist's *Camellia*, by putting it in a house rather warmer, and with less admission of air, than suits greenhouse plants in general; impregnating the stigma, and taking off the corolla before it begins to decay, and cutting away the petals that adhere to the germen or young seed-vessel, that the air may have free admission to it; without which precaution it will perish in most cases from damp. The striped sorts have usually more white in their flowers when they flower early in the spring, and it seems that the seed ripened earliest in the year is the most apt to yield white or pied seedlings. There is a strange mutability in the flowering of *Camellias*, of which the Pom-pone, which has been called on that account *variabilis*, furnishes a striking instance. It has four distinguishable kinds of flower, the pure white and the red-eyed, which appear promiscuously, the brindled pink, and the rose-coloured, which may be kept separate with tolerable certainty by grafting from the branch that bears them, the rose-coloured form being the Peony-flowered of the nurserymen. There is a branch on my oldest plant of the peony-flowered, which has reverted to the pure white colour, an occurrence less common than the departure from it. Carnations, which have run to red, very seldom revert to the white-stripe. I have been informed that the Chinese do not reckon seedling *Camellias* confirmed in their habit, till they have flowered six or seven seasons without becoming less double. I have not found any of mine, thus raised several years ago, degenerate from their first appearance. Of the Chinese, the double white, the buff, the fringed white, and, as far as we know, the red variety, called *imbricata*, are the only sorts that never bear anthers. Having cultivated the myrtle-leaved above twenty-five years, I never saw that variety bear an anther in my collection, except one season, when all the flowers on every plant of the kind had them, and they were found in two or three late flowers last year; but the seedlings reared from its pollen, of which great expectations were entertained, proved to be the worst I had ever raised, and it seemed that whatever peculiarity of the season inclined the flowers to deviate from their usual double form, and approach nearer to the fertile single-flowered original, disposed also the pollen to generate single seedlings. I have seen the myrtle-leaved with anthers at Mr. Knight's nursery, though the circumstance has been so rare in my own collection; perhaps it may be connected with the more or less luxuriant growth of the plant.

It is to be lamented that more experiments have not been tried to improve the races of agricultural vegetables by crossing. I impregnated in 1834 with great care the Swedish turnip (*ruta-baga*) with pollen of the white, and another branch thereof with that of the red-rooted turnip, which produces perhaps a greater tonnage than the white, bearing both frosts and unfavourable summers better, and thriving in soils where the

white does not succeed. The seed was sown immediately, and the plants of both crosses, though late, formed pretty good roots. The leaves differed in appearance from those of the Swedes, and did not, like them, retain the rainwater on their surface. In the following spring they were set for seed in two different situations where no extraneous pollen might have access. The flowers of the greater part were of the bright yellow of the two male parents; a smaller portion in each lot produced straw-colour blossom, like that of the Swede: but not one shewed the least disposition to an intermediate tint; and it seemed as if those two colours were incapable of blending, or modifying each other. I have a crop from their seed this year, but the season has been particularly unfavourable for all turnips; the fly destroyed the first sown, and the plants being again too backward, I do not think their value will be fully ascertained from the present crop.

There seems no reason to doubt that better varieties of wheat, oats, and barley may yet be obtained by combining the hardiness of one, with the productiveness of another sort, and the finer skin or greater weight of a third. I am inclined to think that I have derived advantage from impregnating the flower, from which I wished to obtain seed, with pollen from another individual of the same variety, or at least from another flower, rather than with its own; and as races of animals are known to degenerate, if they are perpetuated by the union of near kindred, it seems not unlikely that vigour may be given also to any race of vegetables by introducing a cross, though of the same kind, and especially from an individual grown in a different soil or aspect. To illustrate this, I will state a circumstance which occurred last summer in my stove. Nine very fine crosses of *Hippeastrum* were flowering there at the same time; one a natural seedling from *Johnsoni* or *Regio-vittatum*, two *Johnsoni-pulverulentum*, one *Johnsoni-vittatum*, one *Psittacino-Johnsoni*, one from *Psittacino-Johnsoni* crossed again by *Vittato-Johnsoni*, one from *Johnsoni* by *Solandriflorum*, and two from *Vittato-Johnsoni* by the same. Being desirous of blending again these plants which were all cross-bred, different flowers were touched with pollen from their several neighbours and ticketed, and other flowers were touched with their own pollen. Almost every flower that was touched with pollen from another cross produced seed abundantly, and those which were touched with their own either failed entirely or formed slowly a pod of inferior size with fewer seeds, the cross impregnation decidedly taking the lead. It appears to me that this circumstance may be analogous to the introduction of a male from another flock or herd, which has been found advantageous to the breed of domestic animals; and I would advise gardeners to try the effect of setting flowers with the dust from another individual in preference to their own, with a view to obtain an improved breed.

It is only from the superior efficacy of the pollen of another plant, that we can account for the circumstance of some hybrid plants, which breed freely with plants of either parental stock and fecundate them, not producing seed readily when left to themselves; for if their pollen is able to fertilize, and their ovary to be fertilized, there can be no positive

sterility in the plant, though there may be a want of sufficient energy under certain, or perhaps under ordinary, circumstances. Many centuries of experimental cultivation must elapse before the subject can be, if ever, fully understood; and I cannot suppose that my present view of it will not require to be modified by the results of future investigation. For instance, there seems little prospect of being able to answer why the hybridizing process is so easy in some genera and so difficult in others, if equally facile of access, unless it shall be found to arise from greater or less constitutional conformity.

The genus *Calceolaria* affords greater facility than most others, because its stigma is nearly obsolete before the pollen of the flower is ready, and, in the earliest stage of the bud, it is easy to lift up the corolla, and take out the anthers, which are then comparatively large and exposed, and the stigma may be fertilized at that early period, when it is defended by the covering of the corolla from any accidental intrusion. Amongst the *Amaryllideæ* there is for the most part much facility of performing the operation in the several genera, the anthers not being reversed to display the pollen till a little while after the expansion of the flower; yet in the genus *Hippeastrum* there is a complete readiness of all the species to intermix when crossed artificially, and in the genus *Crinum* nearly so, while in *Zephyranthes* it is extremely difficult to obtain hybrid seed, and repeated disappointments occur from the escape of some particles of the natural pollen in taking out the anthers. In the genus *Crinum* one unintelligible impediment appeared for a long time to exist. *C. Capense*, which bred freely with every other species, refused to be fertilized by the tropical Cape-coast kinds, *Broussonetianum*, and *petiolatum* or *spectabile*. A seedling has, however, at last been obtained at Spofforth from *C. Capense* by the latter, which I believe to be correct, and it can scarcely be doubted that the difficulty arises from some constitutional peculiarities in those plants. In general hybrid plants have been found to be excessively florid, but sometimes the contrary has been the case, and there appears to be some impediment to the perfection of their blossom. The mule between *Hymenocallis disticha* and *rotata*, which was raised many years ago, whether it be in the stove or in the open air, where it grew against the front wall of the stove, throws up, after its proper time of flowering, an abortive scape, on which the buds are dead and discoloured, as *Amaryllis Belladonna* does at the time its leaves push in the spring, when the previous autumn has been unfavourable to its flowering. In the course of above fourteen years since it was raised, it has only once attempted to expand its flowers, and that in a very unsatisfactory manner in the stove; but I have lately had reason to suspect that more wet is necessary to it than to either of its parents, and perhaps absolute immersion at the time of flowering. I may take this opportunity of stating that the plant which I fancied many years ago to have been obtained from *C. Capense* by *Hymenocallis* (then *Pancratium*) *disticha*, proved, as it advanced, to have been by *C. Canaliculatum*. There had been an error in the memorandum made concerning it, or the flower had been touched by the pollen of both plants. A very interesting *Crinum*, of which only one plant was raised, from *C. defixum*

by *speciosum* for several years put forth abortive scapes, but it has flowered well the two or three last seasons, though it has yielded no increase in any manner; neither has the fine plant which was raised from *Scabrum* by *Canaliculatum*. One of the handsomest white sorts, from *C. brevifolium* by the larger variety of *erubescens*, having a strong red root-stem, somewhat like *Amabile*, has afforded many offsets but no seed. The only genus in which I had observed barrenness of the offspring appearing to arise from the botanical difference of parents, whose constitution seemed very similar, was *Nerine*, of which the crosses between the division with regular and that with distorted filaments had borne no seed; but in that case the discrepancy was so important that it might have been almost supposed to afford a generic distinction, and Mr. Salisbury had named the *Distortæ* *Loxanthus*. In the article *Nerine*, p. 283, I have given an account of a mule from the distorted *N. pulchella* by the regular *curvifolia*, of which the flowers are exceedingly similar to those of the cross between *undulata* and *curvifolia*, plate 45, but more healthful and free. The last-mentioned cross, as far as I have seen, is quite sterile, the parents having differed not only in regularity of perianth, but in the mode of flowering; for the inflorescence of *undulata* is centrifugal—that of *pulchella*, as well as *curvifolia*, centripetal; from which conformity I anticipated the more probable fertility of the mule. That conjecture has been verified, since the former pages were sent to the press, by the production of healthy seed from the mule *curvifolia-pulchella*, and an abundant crop from two plants of *curvifolia* by the pollen of the mule, no other *Nerine* having been permitted to develop its anthers on the premises. Here, then, is a feature which had been overlooked, which seems, nevertheless, to have a powerful influence over the fertility of the offspring. The seeding of this mule is fatal to Salisbury's genus *Loxanthus*, if any doubt could have remained after the production of the former intermixture. In the tubular African heaths the pollen remains confined, unless the anthers are touched by something inserted, as the point of a pin or the proboscis of an insect, when they spring asunder and discharge it. This genus, therefore, affords greater facility of intermixing, and it is probable that some of the native species, which are said to be quite local, have been produced by accidental intermixture of two other kinds. There is a natural species of *Goodia*, quite permanent by seed, which I had many years ago named *intermedia*, but which appears in Sweet's *Hortus Britannicus* under the name *subpubescens*, which is so exactly intermediate between *lotifolia* and *pubescens* in all points, that it can scarcely be doubted that it might be produced by crossing those two species. Amongst other crosses of *Ericæ*, I obtained at Mitcham many plants from two very dissimilar, namely, from *Jasminiflora* by *vestita coccinea*, which had the foliage slender and near an inch long. The late Mr. Salisbury had conceived that those two species, being distinguished by a shorter and a longer and more pointed pod, were referable to two distinct genera to which he had accordingly assigned names, and he told me that I should fail in my attempt to cross them; which was answered by shewing him the seedlings then several inches high. They were all lost on, or soon after, removing to Spofforth before they had flowered, though one of them was above a foot high. The

disposition to sterility which had been stated to exist especially in the offspring of parents of different constitutions, offers a great impediment to the unlimited use of crossing in the fruit-garden, but it is certain that great advantage may be derived by the cultivator, who will strive to bring together the various good qualities of the sorts between which no such obstacle exists; and the complete fertility of the fruit-bearing *Cerei* makes it very uncertain where such obstacles will be found to interfere, before the experiment is made. I have already mentioned that *Crinum scabro-capense*, though the pollen of different species was applied to it had continued about sixteen years perfectly sterile. In 1834 a plant of it which had been growing the greater part of that time out of doors in front of the stove, produced one small seed. It vegetated, but the leaf was from the first of a yellowish white, and the plant did not live many weeks. In 1835 it produced another and larger seed, the early part of the summer having been very hot both those seasons. This seed was sown in white sand to try to save it from perishing like the former, and a thriving young plant has been obtained from it. Whether they are the produce of its own pollen, or that of *Pedunculato-capense*, which grew beside it, cannot yet be judged with certainty; but the seedling now growing vigorously, has deep green leaves, and does not shew any approximation to the glaucous hue* of *C. Capense*, of which a large bed was not far off; and that hue would probably have been very apparent, if it had been so crossed again. I had often attempted to fertilize *C. Capense* by the pollen of this beautiful mule unsuccessfully, but the circumstance of the two seeds it has borne shews that it is possible to obtain such a second cross, which would be a great acquisition, as it would certainly yield a plant of hardier constitution, and able to bloom in our open gardens, with much greater beauty of flower than *Capense* itself.

I have not found as yet the results which might perhaps have been expected, and which Mr. Knight seems to have obtained, from carefully blending the pollen of more than one species before its application. I attempted to fecundate *calceolaria plantaginea* with the pollen of twelve species, most industriously mixed together, but very few seeds were ripened, and the produce differed very little from those which had been procured by the pollen of one of the twelve species. Further experiments are necessary to establish how far the influence of different males can act simultaneously, by admixture of the dust. I have obtained mule seed and natural seed from the same capsule, but they were probably formed in different cells. Experiments should be made to ascertain whether, in cases of partial and imperfect fecundation, the pollen of another species, and even of nearly allied genus which could not alone fertilize the ovary, can act in conjunction with a single grain, or at least with an insufficient quantity of the natural dust to effect the fertilization,

* Since these pages were prepared for the press, the supposed seedling from *C. Capense* by *Spectabile*, which had grown very slowly, having been immersed in water in the stove has pushed vigorously, and my present opinion is that it will prove to be a natural *Capense* produced by the escape of some particle of maternal pollen, notwithstanding all the precautions which had been taken. This seedling had been glaucous from an early age. The refusal of the *W. African* species, *Spectabile* and *Broussonetianum*, to breed with *Capense* is therefore not yet overcome.

and occasion the seed to produce a variety, not actually hybrid, but in some degree departing from the natural form. See, above, the account of *Hymenocallis amœna*, var. *lorata*, p. 211. It is certain, by the result of many experiments, made at Spofforth, that the pollen of a nearly allied genus, which cannot effect the production of seed that will vegetate, will often cause some of the ovules to swell to a large, and occasionally to a preposterous, size, and become seed-like masses without an embryo, and the same circumstance has been observed in Germany; and, as it can act so far, I do not see the impossibility of its influencing the character of the produce, where the access of natural pollen is insufficient; and it seems to me questionable whether some of the singular varieties which occur among vegetables may not have been so produced.

A very singular occurrence in the history of cross-bred plants took place last year in the garden of my brother (Hon. Algernon Herbert), at Ickleton, in Cambridgeshire, which deserves the attention of naturalists. In 1834 he purchased a plant, grafted from a hybrid *Cytisus*, known to have been raised in France between *C. laburnum* and *purpureus*, of which the leaves are as large as those of *laburnum*, though a little different in form, the flowers of a dingy and rather coppery purple in long racemes. The plant purchased consisted of a strong *laburnum* stock about 8 inches, and a grafted scion about 16, high. Its growth that year was vigorous. In 1835, from a strong branch, which was not in existence when the plant was purchased, proceeded a small shoot a foot and half long, covered with small leaves of the exact size and very nearly of the form of those of the little *C. purpureus*, while the rest of the tree, having reached the height of 8 feet, had the usual large foliage, approaching in appearance to that of the *laburnum*. This extraordinary branch, which has in a great measure, though not exactly, assimilated itself to the structure and habits of that one of the two parents to which the mule had originally the least resemblance, has this year, like that parent, produced small flowers, four at each joint, from the axills of the leaves, in the same manner as *C. purpureus*, and of a colour more purple than the pendulous racemes on the other branches, which had about 16 flowers on a spike. This fact is scarcely less wonderful than if a mule, between a mare and an ass, were at three years old to acquire an ass's tail. It was positively stated to me, 30 years ago, by a nurseryman, that Spong's rose was not a seedling, but an accidental sucker from the rose de Meaux, which had assumed a different character of leaf and flower, and maintained its diversity: a phenomenon which, if true, appears to be in some degree analogous. I have also seen the flower of the yellow Austrian *rosa lutea* borne upon a branch of the two-coloured var. *bicolor*, improperly called a Persian species, *purpurea*, by Sweet; but certainly a garden cross from *lutea*. Jacquin had observed, also, that this two-coloured plant sometimes bore flowers entirely yellow.

I am not informed which was the female parent of the hybrid *cytissus*, but I entertain no doubt that it was the *laburnum*, because the foliage approximates to it, and the flower follows rather the colour of *purpureus*; as the mule *Rhododendrons* by *Azalea Pontica* have the ever-green leaf of the former, and are more disposed to follow the yellow col-

our of the latter. The natural leaves of the hybrid cytisus are about four times as long, and four times as broad, that is, sixteen times as large as those of the curious branch on which the leaves are as crowded as on *C. purpureus*; the general foliage of the tree, though altered from the exact shape of the laburnum, being little, if at all, reduced in size. I have been told, but cannot verify the fact, that a like circumstance has occurred in France to a plant of the same mule. Grafts or layers from the anomalous branch will in all probability preserve their acquired character, and be so propagated as a distinct plant.

It was apparent to me that no botanist had been able to distinguish *Nicotiana*, *Salpiglossis*, and *Petunia*, except by features which I knew to be unsupported by the fact, though *Salpiglossis*, in my humble opinion, has been erroneously placed in a different order and alliance from the others, plants with five stamina being considered *Solanæ*, and those in which the fifth is wanting *Scrophularinæ*. I had ascertained the utter invalidity of that feature, having seen flowers of the same *Salpiglossis* with only four stamens, with five fertile stamens, and with four fertile stamens and one abortive; and, as in *Nicotiana* the fifth stamen is always of a different power and inserted differently from the other four, I was inclined to believe them to be one genus, and I made a great many attempts to cross them, but in vain. On further examination of those plants I find a diversity of the seeds, which are very small, and must be examined with a magnifier. Those of *Salpiglossis* are angular; see pl. 43. f. 50. In other respects, although its aspect is easily recognized, it is not so easily separated by any decided distinction from *Nicotiana*; and it has been incorrectly characterized by one of the stamina barren, since the fifth is sometimes entirely wanting, and sometimes fertile. The character of *Nicotiana* in the *Bot. Mag.* is quite untrue; founded on one species, and inapplicable to others. That genus affords an instance of the unimportance of the more or less continued adhesion of decurrent filaments, the adhesion varying greatly in the different species. See the seeds of *Nicotiana*, pl. 43. f. 51 and 52. They are not angular, but more oblong and reniform than those of *Petunia*, which are nearly round, and pitted all over. See *Pet. linearis*, pl. 43. f. 48. I never doubted the diversity of *Nierenbergia*, but it stands yet undefined. Dr. Lindley characterised it by the reflex uneate lobes of the stigma, but the stigma will prove often a treacherous feature in botanical characters; and Professor Don, having found in *N. aristata* a stigma of which the lobes are very little more reflex than in *Petunia*, at once assumed that they were one genus. They are, I doubt not, substantially distinct, but the generic character of *Nierenbergia* must be, *Tube slender cylindrical, limb wide-funnel-shaped, stamina adhesive to the style and stigma*. I have never seen more than one seed perfected in a pod of *Nierenbergia*, the rest of the ovules proving abortive, and the capsule so small that it is often overlooked when ripe; the seed of *filifolia* is oval with the back rounded. See pl. 43. f. 47. I see nothing in *N. aristata* to reconcile it to *Petunia*. The lovely *N. calycina* has a much greater affinity to *Petunia* from its trailing inflorescence and general aspect; but, if *petunia* can be shewn to be one with *Nierenbergia*, there will remain

nothing to separate them from *Nicotiana*. I am, however, now almost satisfied of the diversity of *Petunia* and *Nicotiana*, wishing, however, cultivators to persevere awhile in the attempt to cross them; for *Petunia* and *Nicotiana* have much closer affinity than the others, and their distinction is more questionable. I am, however, by no means satisfied that, if they are distinct, *Petunia linearis* (*Salpiglossis integrifolia*, Bot. Mag. Nierenbergia, Sweet's B. f. g.) may not belong to a fifth genus. It is certainly neither a *Salpiglossis* nor a *Nierenbergia*, and its seeds conform with *Petunia*, but it has a different aspect, and I cannot cross it with the other sorts of *Petunia*. It will belong at least to a separate section of *Petunia* with linear leaves. It is very remarkable that, although there is a great difference in the form of the flower, especially of the tube, of *P. nyctanigenæflora* and *phœnicea*, the mules between them are not only fertile, but I have found them seed much more freely with me than either parent. The mules I had raised from the former by the latter, having been forced early in the spring of 1835, set their seed before any other *petunia* was in flower on the premises, and must therefore have been fructified by its own pollen. The white impregnated by the dust of the mule, and the mule by it, produce a great deal of sporting, but from a pod of the abovementioned mule to which no pollen but its own had access, I had a large batch of seedlings in which there was no variability or difference from itself; and it is evident that the mule planted by itself, in a congenial climate, would reproduce itself as a species; at least as much deserving to be so considered, as the various *Calceolarias* of different districts in South America.

I have little to add to this treatise, but my regret that it is necessarily so imperfect; and, from the nature of the subject and the additions made to it since it was first written, of somewhat too desultory a character. I hope, however, that it may have the effect of removing some erroneous impressions, and contribute its humble mite towards the elucidation of truth; and that, by giving the public a clearer view of what has been effected, it may enable those, who are disposed to pursue experiments on this subject, to conduct them with greater advantage. I have by no means enumerated all the genera in which crosses have been lately introduced, as for instance, *Potentilla* and *Anagallis*, in the last of which I have seen a remarkable result in the production of a reddish purple flower, by the union of the orange with the bright blue. I have an hybrid from the little *Hibiscus ficulneus* by *manihot*, which, with leaves that preserve the form of those of *ficulneus*, has the vigor and statute of *manihot* with its terminal spike, but with small axillary flowering branches also. I had likewise a cross from *H. palustris* by *speciosus*, but the plants were so delicate that all died before they had made a fourth leaf. I apprehend that several genera are comprehended under the name *Hibiscus*, which shews a great diversity of fruit, and an interesting course of experiments might be conducted to ascertain whether any cross can be obtained between those which differ in that respect, and whether they are all convertible within certain demarcations. Cultivators are too apt to believe they have obtained the cross they have been desirous of producing, when they have really a natural seedling variety. I can

have no doubt in saying that the plant figured under the name *Azalea Rawsoni*, (Paxton, p. 123.) which Mr. Rawson's gardener fancied to be a cross between *Az. Indica* and *Rh. Dauricum*, is not allied to the latter plant, but a genuine *Az. Indica*, perhaps from a cross between two varieties of that plant. In speaking of the varieties of *Camellia*, I should have noticed Ford's handsome variety in Paxton's work, but I never saw it, and am ignorant of its origin.

THE EARLY HYBRIDISERS AND THE ORIGINS OF GENETICS

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The importance of the early hybridisers, Kölreuter and Gärtner, Knight and Herbert, lies in what their work did to lay the foundations of genetics as we know it to-day, and in order to understand what this means we have to enquire what those foundations are.

The Greek philosophers who first speculated about the nature of things paid more attention than is generally realised to problems of heredity. And what they said is worth considering, because they disputed about questions that we still dispute about. Their problems are still alive. They were mainly concerned with animals so far as sexual reproduction was concerned, although they, or at least some of them, realised that a differentiation of sexes occurred in plants. They had already learnt what some primitive people have not yet learnt, that the male as well as the female are necessary for reproduction. Some even considered the male the most important, a view still expressed in our social usage. It was generally held that evolution of some kind had taken place, though its comprehensive nature was not generally grasped. In regard to its mechanism a wide cleavage of opinion arose between two schools. There were on the one hand those who like Aristotle supposed that a purpose, divine or natural, worked by the inheritance of acquired characters to produce conformity with an imagined harmony of nature. On the other hand there were those who saw no purpose or design in the order of things, and conceived of living organisms as growing and changing according to deterministic laws, laws which equally governed non-living beings. Such a cleavage still persists to-day.

These disputes did not rest on the strict experimental evidence that can now be adduced but merely on observations of a world which clearly provides by its ordinary changes the means of testing many fundamental hypotheses as it still does in astronomy and cytology. From such observations emerged one theory which we ought to keep in mind because it agrees in so many respects with the views underlying modern genetics. This was the theory developed with closely reasoned argument by the atomic and materialistic philosophers and preserved for us largely in the great poem of Lucretius. It may be summarised under five heads—(1) Material bodies handed down from one generation to the next determined heredity both of body and mind. Matter being atomic, inheritance was atomic or particulate as we now call it; (2) The offspring were derived from materials of both parents, sometimes more of one than of the other, the two being therefore merely statistically equal; (3) Separation and recombination of these bodies in the course of sexual reproduction was responsible for the separation, recombination and reversion of characters; (4) Evolution occurred in the sense that some species became extinct while others changed. Man for example had developed from brutish ancestors without law or language. There was no all-embracing scheme of evolutionary change and there was equally no

conception of species being fixed; and (5) New structures arose by chance and survived if they were useful. Nature eliminated unprofitable types. They did not come into being for a purpose or in response to use. Aristotle thought this was leaving too much to chance, an argument that was equally to be used against Darwin.

There is no doubt that with the coming of Christianity the unpalatable views of the atomists were suppressed. Divine purpose and the inheritance of the effects of sin are part and parcel of revealed religion as well as of popular prejudice. When philosophical support was needed by the mediaeval church to satisfy the growth of intellectual enquiry, Aristotle was established as the authority and the materialistic explanations of heredity, if they had not already been forgotten, were left unheeded. Just as the flat earth and geocentric theories already rejected by Greek mathematicians had to be disproved again by modern astronomy, so the fixity of species and the inheritance of acquired characters rejected by the atomists had to be unlearned again by modern genetics. In both cases the new discovery seems to have disregarded the old. The traditional opposition to it has also been deeper and the proof therefore has had to be more rigorous.

Modern science is not derived from Greek atomism but it is in harmony with it. Modern science is philosophically inarticulate. Its philosophical method has been expressed by Bacon, but it was intuitive in Bacon's contemporaries and has remained so in most of their successors. The complexity and specialisation of recent science has aggravated this fault and has led to special errors that we shall see later. Modern biology has therefore developed in complete ignorance of Greek materialism. It has had to start from the beginning again. Indeed, worse than that, it has had to start with the special incubus of the dogma of special creation, a dogma which has taken 100 years to destroy. One effect of this dogma was probably to attach greater interest to the precise determination of species than would otherwise have arisen. Since species were as they always had been, they would likewise remain as they always had been. Their describers borrowed an eponymous immorality from the dogma of fixity they religiously applied. The vastly increased flora and fauna thrown open to our study by the great navigations have occupied systematists ever since. But it would be a mistake to imagine that the founders of systematics considered species in the formal way that has been adopted by most of their imitators. John Ray in 1686 gave us a definition of a species which cannot be improved upon to-day. It is not a definition generally used by systematists. No more certain criterion of a species exists, he says, than that it breeds true within its own limits (*"nulla certior occurrit quam distincta propagatio ex semine"*). In other words the species of convenience is also the species of descent.

Ray's definition, like Linnaeus's which followed it, was genetic. It was with them a working hypothesis and no dogma at all. The need of testing it was to a great extent the stimulus of the early hybridisers. During the lifetime of Linnaeus it became gradually realised that species of plants as well as animals would cross and even give fertile hybrids. The foundations of the notion of fixity were being undermined. And

Linnaeus realised it although again his disciples did not. In his essay on the sexes of plants in 1760 we find him asking himself whether all the members of a genus cannot be supposed to have a common ancestor, and bravely advocating the study of hybrids to his fellow botanists.

Linnaeus's advice had been anticipated by the work of Kölreuter, who published the first extensive treatment of artificial hybrids in the following year. Kölreuter's book marks an important advance in two ways. He not only made controlled crosses between species; he attempted to find out what the physical means of reproduction was at the same time. He examined pollen-grains and he tried to see whether individual pollen grains would succeed in fertilisation. His observations showed the lines on which future progress would be made, but he was not very successful. The microscope was still inadequate. Consequently Kölreuter spoke of mass effects where we would now speak of individual combinations. Kölreuter, unlike Linnaeus, did not consider that hybridisation made possible the production of new species or could be held to account for the origin of old ones. To him and to his contemporaries the sterility of hybrids proved the fixity of species, and if a hybrid was not sterile its parents were not different species. The important evolutionary bearings of hybridisation were therefore lost until the question was taken up by Herbert in 1819.

William Herbert was at once a practical systematist and a practical hybridiser. He knew that he could "create" (as he called it) new forms by hybridisation within genera. He knew that in some genera all the species would cross. He believed that organisms had been created by the Almighty at a relatively recent date. He therefore concluded (as Linnaeus had done but with more evidence and more conviction) that the genera had been created and that the species were derived from them by later change. With his religious convictions no more was possible. It was however the thin edge of the wedge that Darwin drove home.

At the same time Herbert reaffirmed the genetic definition of species as groups which "naturally maintain themselves distinct" (almost the words of Ray) while there was "no real or natural line of difference between species and permanent or descendible variety" (almost the words of Darwin).

Herbert bridges the gap not only between Ray and Darwin but also between Kölreuter and Mendel. In his early years men spoke of forces of heredity (perhaps they still do), others spoke of essences and fluids and others still of tinctures and tendencies. The ancient notion popularised by Linnaeus that the outside was derived from the mother, the inside from the father, was still prevalent. But when Herbert writes in 1847 a change has taken place. Pollen tubes have been seen to grow down the style and enter the ovule. It is no longer necessary to cut off the styles to prove as he had done that fertilisation is not instantaneous. The structure of the plant has been reduced to cells as units. Nuclei have been observed in these cells. Herbert concludes that "the fecundation of the ovules is not a simple but a complicated process." Nevertheless he concludes also that "we are utterly in the dark as to the mystery of fertilisation."

Herbert was evidently born too soon to appreciate the later cytological discoveries. His industry led him to try innumerable experiments many of which would have been unnecessary in the light of microscopic observation, and often with results which were bound to be confusing, working as he was with species of various kinds whose nature he could not possibly tell. When for example he produced true-breeding hybrids in *Amaryllis* and *Oenothera* he could not know that he might be dealing with polyploids in the one case and permanent interchange hybrids in the other, from whose behaviour no general rule could be drawn. Others have been less discreet. Again in the absence of cytological observation the distinction between self-sterility and cross-sterility was a baffling one. Only later was Darwin able to distinguish between the failure of the pollen-tube and the failure of the embryo. Microscopic observation showed the way to genetic analysis.

A younger man was bound to look at the matter differently. The discovery between 1840 and 1860 of the unitary and cellular character of the processes of fertilisation naturally made it possible to look at the whole of heredity from a new point of view. At the same time Darwin had been collecting the diverse evidence of variation and hybridisation, palaeontology and stratigraphy into one consistent and deterministic account of evolution. These two advances brought men back to the materialistic way of thinking that had been lost in biology for so long. The one who profited by this was Mendel. In a sense he did nothing that had not been done before. He crossed different varieties of peas and discovered dominance of the characters of one parent in the first generation, as Knight had done. He discovered segregation of their differences in the second generation, as Goss and Seton had done. He explained the properties of the cotyledons as properties of the seedling generation, as Knight had also done. He proved, according to a letter of 1870, that single pollen grains effected fertilisation, as Kölreuter had at least attempted to do.

The difference between Mendel and his predecessors was that he knew the material processes underlying heredity and had the kind of mind that could explain their results in a material way. He understood that the simplest assumptions always had to be used until they were disproved. The cell-theory and the evolution theory displayed to him "the unity in the developmental plan of organic life." The importance of studies of the fusion of cells in the fertilisation of fishes and algae would not therefore escape him. We find also that he rejects continuity in variation. Darwin had invented continuity in biology just when discontinuity had been established in chemistry, a mistake the Greeks looking at science as a whole could never have made. We also find that Mendel rejected the improvement of plants by cultivation and the general Lamarckian theory into which Darwin lapsed only a few years later. In view of all these things we cannot even be surprised when we learn from the convincing argument of Fisher that Mendel knew what he was going to get before he began his critical experiments in hybridisation. He did not draw his bow at a venture.

Mendel directed his enquiries with a rigorous determinism. He assumed that every property of every seedling was determined by something that happened in its two parents. He had therefore to consider all the progeny from a cross and all their characters. In order to do so and find out the law governing what happened in the parents he had to take their characters individually and he had to take their progeny individually. He had to count them. None of his predecessors had the audacity and conviction in determinism to make such a task seem worth while. De Vilmorin, who recognised the importance of individuals, worked only on inbred stocks. Goss and Seton began counting, but they were baulked by not realising that an exact equality at segregation will not necessarily give an exact equality in the progeny because every germ cell will not act. A conviction of determinism and uniformity led Mendel to the view that the same rules applied to all organisms; nevertheless the great majority of biologists were then (and still are now) too faint-hearted to use such bold assumptions in their work. They are continually afraid of being swept off their feet by a revolutionary hypothesis.

Mendel's theory therefore meant a release from prejudice that was as important to purely scientific thought as Darwin's theory had been. Together they undid the superstitions of two thousand years and brought us back to the principles enunciated by Lucretius.

The inevitable relationship between the practice of breeding and the observation of the reproductive structures—sperm, eggs, and nowadays, chromosomes and genes—is made doubly clear owing to the freak of history by which Mendel's work was lost for 30 years, overshadowed by Darwinism. Mendel knew of cells and nuclei. He went further to something inside the nuclei. We may say that he predicted the genes. While his paper was still unknown Weismann arrived in 1892 at precisely the same conclusion on entirely different evidence, on the evidence in fact that the microscope had only just brought to light. Fertilisation had been found in 1875 to consist in the fusion of nuclei. The division of nuclei had been found to perpetuate a constant number of chromosomes. Weismann predicted the occurrence of a reduction to compensate for the addition of chromosomes in the nuclei at fertilisation. The chromosomes consisted of units or particles responsible for heredity. Variation must therefore be discontinuous and the differences responsible must separate and recombine as the chromosomes are observed to do. The chromosomes being handed down from generation to generation unchanged, except in their combinations, the inheritance of acquired characters was excluded. We now know from a consideration of plants that the distinction between body cells and germ cells is not, as Weismann thought, the basis of this separation, but rather the distinction between changing cells and their permanent nuclei.

This great parallelism of independent discovery is matched by smaller parallels at the same time. The atomism implicit in both Weismann's and Mendel's theories was independently proclaimed, again on quite different grounds, by Bateson as discontinuity and by de Vries as mutation. The distinction made between germ and body on cytological grounds was immediately paralleled by Johannsen's distinction, on

breeding evidence, between genotype and phenotype. In defining a genotype as that internal and hereditary character which reacted with the environment to produce the external and observed character or phenotype, Johannsen established the primary and operative axiom of genetics. He thus defined, as Weismann had done, the contrast between the static system of the permanent chromosomes which is responsible for heredity and the dynamic system of reactions they set in motion, which is responsible for development. In the experiments on which he based his definition he established the independence of genotype and environment and abolished all the loose and slippery arguments on which Lamarckian doctrines have always depended.

Never before in the history of science had the same theories been arrived at independently on such entirely different evidence. In such circumstances we might expect that the new discipline would be readily embraced. In fact however the process of conversion, in spite of the powerful advocacy of Johannsen and Bateson, has been gradual and is still incomplete. There are many who still find it difficult to separate the character from the individual who bears it. There are many who dare not follow Mendel's analytical way and think of gametes in breeding instead of zygotes, many who consequently cannot face Mendel's definition of a hybrid without misgiving. They will still imagine that they can recognise a hybrid by its appearance, by its mere phenotype. And there are many who refuse to believe that visible agents are sufficient to effect visible results and that there is not something else behind the chromosomes which will permit mystical definitions of heredity and species. The reformation has been too profound to be accepted by those brought up in the old tenets. They prefer to halt between two opinions.

The most immediately obvious and direct conclusion from Mendel's work was that a new individual or zygote produced by fertilisation owes its directly and predictably constitution to the germ cells or gametes which go to make it, and not to the parents which provide those gametes. A hybrid is therefore the product of the union of dissimilar gametes and not necessarily of dissimilar zygotes. Yet this definition is scarcely recognised outside experimental genetics to-day.

In learning the properties of hybrids we have not merely discovered the general laws of heredity and variation, we have come to understand the nature of particular species. The troubled history of *Oenothera* has been a struggle for fifty years between those who considered its forms as species and those who objected to them as hybrids. The solution came when it was realised that they were both. The paradox of the permanent hybrid then revealed how sex-chromosomes came about and sex-determination developed in its multifarious ways.

It must not be supposed therefore that the earlier development of genetics was smooth. The separation of breeding work and cytology led to many unfortunate results. Each technique has its own vices. Just as experimental breeding unrelated with cytology led de Vries and Bateson up several false trails, so cytology unrelated with experimental breeding led Roux to the struggle of the parts and Weismann to a theory of germinal selection, as he called it, in which all differentiation depended

on a sorting out of determinants within the body during development. We find as late as 1911 Johannsen saying that "The question of chromosomes as the presumed 'bearers of hereditary qualities' seems to be an idle one." And Bateson later maintains much the same view. Genetics, we see, as indeed other sciences, has been like a drawer that we pull out by uneasy jerks, first one side, then the other.

All this shows the prejudices with which present-day genetics is struggling in establishing itself in a proper relationship to other branches of biology. But the weapons with which it is now equipped make its task much easier than it was in the time of Herbert and Darwin. The immediate consequence of the union of breeding and cytology was the development of exact genetics in *Drosophila* on extremely mechanistic lines. It was assumed that since heredity is particulate, variation is also particulate, and by the combination of these particles or genes evolution resulted. Gradually however it was realised that variation is not necessarily particulate. Changes of proportion and position in the genes make a direct and mechanical description of variation impossible. Variation and likewise hybridisation are of many kinds, depending on the many kinds of change that can take place in genes and in their arrangement. Simplicity has again given place to complexity, but it is a complexity within the reach of our understanding, a complexity we can use in showing the forms and processes of living things as parts of a single system.

The refined technique of breeding, the high power of magnification of chromosomes, the X-ray method of producing mutations and also of analysing molecular structure are bringing nearer the time when we shall be able to say that genetics has demonstrated the unity not merely of biology but of science itself.

WILDER'S ADVENTURES WITH HARDY BULBS¹

There are not enough bulbous plants grown in this country; there is not enough proemial curiosity concerning them. There are plenty of big tulips grown, many daffodils, a good many crocuses, some snowdrops, and a few others, but there is a vast reservoir of beauty and interest that is seldom tapped by any save the gardener with an explorative or adventurous turn of mind.

—LOUISE BEEBE WILDER

This delightful book of 363 pages is packed with interesting observations on bulbous plants based mainly on the author's experience with bulbs over a long period of years in two locations in New York State, one "a cold garden, snow-blanketed as a rule in winter, brilliantly sunny in summer, the soil well on the sandy side with a good deal of lime in it; the second subject to muggish summers, freeze and thaw winters, having a clay subsoil, and a good deal of shade."

It is written in the charming informal style characteristic of the author's other works on gardening. The book is divided into two parts—

¹ *Adventures with Hardy Bulbs*, by Louise Beebe Wilder. Macmillan Co., New York. 1936.

the first is concerned with general observations on the use of little bulbs in the rock garden, naturalizing bulbs, and tender bulbs in the rock garden. Those interested primarily in amaryllids will find here references to daffodils, *Brodiaeas*, *Milla*, *Allium*, *Leucojum*, *Lycoris squamigera*, various species of *Zephyranthes*, *Cooperia*, *Clidanthus fragrans*, and *Sprekelia*.

In the second part, forty genera are considered separately, including the following in which the amaryllid enthusiast is particularly interested—*Allium*, *Brodiaea*, *Galanthus*, *Leucocrinum*, *Leucojum*, *Lycoris* and *Nothoscordum*.

The book is illustrated with excellent drawings and photographs by Walter Beebe Wilder.

—HAMILTON P. TRAUB.

COOMBS' SOUTH AFRICAN PLANTS FOR AMERICAN GARDENS²

Mrs. Coombs, a charter member of the American Amaryllis Society, and a prominent worker in national Garden Club activities, has written a useful and interesting handbook for the beginner about these absorbing and exotic plant novelties. She covers the field quite categorically, with much helpful botanical data and all too few of her own personal comments on the habits and culture of the numerous noteworthy items under consideration.

The book will serve as a valuable fundamental text for those desiring a handy reference volume, in this newly opened field of the South African natives. While advanced students will still need to go to the original sources for fuller information, there is a world of good garden reading and stimulating material to add to the reader's knowledge.

The whole field of South African plants is only just beginning to be opened to the American garden lovers and Mrs. Coombs' book should do much to increase the popularity of the worthwhile types of bulbous plants, succulents, herbaceous plants, shrubs, etc. which abound in the Union of South Africa. The volume is reasonably well illustrated, although some of the pictures leave much to be desired and others are too small to do justice to the subjects. The Amaryllis family comes in for 25 pages or so, including such well known and little known genera as *Agapanthus*, *Amaryllis*, *Ammocharis*, *Buphane*, *Clivia*, *Crinum*, *Crytanthus*, *Haemanthus*, *Nerine*, *Tulbaghia* and *Vallota*.

The book is the product of a number of years intensive investigation of the wealth of Cape flora by the author, who made a trip to South Africa two years ago to round out her studies. There are entertaining introductory chapters on "Native Conditions," "Types and General Cultivation," and "Plans and Suggestions," besides a glossary and indexes.

—WYNDHAM HAYWARD.

² South African Plants, for American Gardens, by Sarah V. Coombs. F. A. Stokes Co. New York. 1936.

MR. WORSLEY HONORED—FIRST AWARD OF
WILLIAM HERBERT MEDAL

The highest honor which can be bestowed by the Society is the William Herbert Medal, founded by the Society in 1936, and awarded for the first time in 1937.

As was expected, the William Herbert Medal Committee, by unanimous vote, made the award to Mr. Arthington Worsley, the Dean of the amaryllid fraternity. He has been and is now a faithful worker with amaryllids and became the torch bearer in this field during the time when interest therein began to decline in the later 19th and first quarter of the 20th centuries. Because of his unselfish devotion to highest principles of conduct, he has inspired the younger workers in the field so that the coming generation can build on the foundation laid by past and present workers.

The sketches for the design of the medal were made by the HERBERTIA editor, Dr. Traub, who writes as follows concerning them,*—

The award of such a medal should represent a dramatic event, the culmination of faithful service, and it should therefore convey its message effectively but without excessive verbiage or crowded sculpturing. Accordingly, the obverse should consist of the sculptured likeness of the first great amaryllid enthusiast, William Herbert, and since as a man of science and letters he belongs to the world, it is not necessary to indicate dates of birth or death, or even his given name. The very simplicity of the obverse therefore conveys a forceful message.

On the reverse a typical amaryllid, in this case a *Hippeastrum*, should be the motif, and the sculptured likeness should be encircled by the names of the great groups in the field of the Society—Hemerocallideae, Amaryllidales, and Alstroemeriales. The award is given "for eminent service" and no more words need be used.

The members of the Society will be interested to know that the original of the portrait on the obverse is the painting of William Herbert by Sir William Beechey, which is at Eton College, Windsor, England. The original of the amaryllid on the reverse is the fine old plate of *Hippeastrum vittatum* from *Thesaurus Botanicus* of Leopold Trattinnick, published in Vienna in 1819. This excellent old text is well worth looking up just for a glimpse at its numerous color plates of amaryllids and other interesting botanical subjects.

Lakemont Gardens,
Winter Park, Florida,
July 15, 1937.

—WYNDHAM HAYWARD.

* The sculpturing was executed by L. G. Balfour Company.



Wyndham Hayward

See page 263

Habranthus cardinalis

Plate 48

1. REGIONAL ACTIVITIES AND EXHIBITIONS

AMARYLLIDS IN KENYA COLONY

THE LADY MURIEL JEX-BLAKE,

Kenya Colony, British East Africa

It is not really very easy to write a second note on the Amaryllidaceae in Kenya, for no great change has taken place in the last year, no new finds have been made among the indigenous plants, and no one has yet got sufficient time or money to specialize in these beautiful, but expensive, bulbs. Our flower shows are still "general purpose" shows, and it will be a long while yet before we can have special shows for any one type of flower. After all, the Colony of Kenya is not forty years old yet, and the gardening spirit is only now beginning to be wider spread and gaining in enthusiasm.

Rereading the excellent and interesting Year Book of the Amaryllis Society for 1935, I have studied, with particular interest Dr. Hutchinson's article.

The botanical revision of any natural order of plants is always rather a worry to the amateur gardener, who has managed to get some family into his head, but in this case at least Dr. Hutchinson has given us as good plants as he has taken from us in his alterations; for the inclusion of the Genera *Agapanthus*, *Allium*, and *Gilliesieae* in the Amaryllideae enriches the family more perhaps than the exclusion of the *Hypoxis*, *Alstroemeria*, and *Agave*; because the first and the last of this trio are not really of very great garden interest, while the new entrants are of considerable decorative value.

I note that the Amaryllis Society has not abandoned the Alstroemeriales in spite of the fact that they now rank as a plant family. The members may be interested to know that *Alstroemeria psittacina*, (or is it *braziliensis* now?) becomes a rather difficult weed in our gardens, while *A. aurantiaca* grows well and flowers luxuriantly only at an altitude of over 7000 ft. Hybrids of *A. chilensis* have flowered with me here, under 6000 ft., but were not happy enough to stay.

Another lovely plant that we grew very well is also an exile from the amaryllids, in which tribe it was included by John Weathers in his "The Bulb Book", published in 1911 (Is this most invaluable book well known in America I wonder?), *Polianthes tuberosa*, more popularly known as the Tuberose, a thoroughly misleading "englishising" of a Latin name. This is a very great "stand by" in this country, for both single and double varieties flower magnificently, and when happily placed go on flowering over very long periods of time.

Having allowed these two outcasts to trespass on your pages, we must go on to the newly legitimised additions, and *Agapanthus*, being an African genus, comes first. Although agapanthus species grow and flower at the comparatively low level of Nairobi (5,500 ft.) it undoubtedly prefers the higher cooler conditions, and to see agapanthus

at its best in Kenya one should go to the gardens at about 7000 to 8000 ft. where it flowers magnificently and increases rapidly. In one garden of my acquaintance it is particularly beautiful in a huge informal group of mixed blue and white, growing under the light shade of *Juniperus procera*, called here the "pencil cedar", and with a foreground of scarlet flowered *Phyllocactus* plants, making a picture long to be remembered. At lower altitudes agapanthus needs rather more moisture if it is to flower well, and does best if planted near water unless the plants can be well drenched by hand watering at intervals. But it will grow anywhere, and give occasional flowers even when unkindly treated.

A dwarf species, *Agapanthus umbellatus minor*, which I brought out from Kew Gardens two years ago, is proving itself very amenable, and is a charming little plant, with narrow foliage only about 8-14 inches long, and masses of 12 inch stems with good sized heads of a deep blue colour and lasting in bloom for many weeks, even in a dry spot.

Hemerocallis does exceedingly well in Kenya, and, to quote the book, *Gardening in East Africa*, "is easily grown in all districts, by the water side, or in any part of the garden, either in sun or in shade." It flowers freely during the greater part of the year, and many species and varieties are grown. Personally I have so far had no success with *Hemerocallis minor*, which refuses to flower at present; but as many plants take a year or two to acclimatize themselves to our conditions, I still hope for success.

The Alliums, so useful in European, and probably in American gardens, are so far not much grown in Kenya, and it is only in the higher, cooler places that these hardy bulbs are likely to flower successfully. But we should be very grateful for hints from gardeners in the Southern States of America, and news of any species which do well in the American tropics and the subtropics of Florida, Southern California, and Texas.

A very nearly allied plant from South Africa, closely or allied to agapanthus, is the *Tulbaghia violacea*, one of a genus of about a dozen species of garlic-smelling herbaceous plants with rhizomatous root-stocks, narrow strap shaped leaves and more or less urn shaped flowers in umbels. *T. violacea* is a charming plant to look at, with green foliage, and clear light violet flowers, from eight to twenty of them in an umbel. In Kenya it never dies down, and flowers almost continually throughout the year, but it smells rankly of garlic if picked or bruised.

The Gilliesieae have not come our way, and I can find very little about them in my reference books, except that they *were* nearly allied to *Lilium*! Are they of garden value at all? The description of *G. graminea* sounds merely dull.

I had hoped to be able to write of new finds on a recent "safari" we have just returned from, when we travelled North, by car, for about three hundred miles from Nairobi into the low, hot, dry country which lies between the White settled area of Kenya, and the Abyssinian border; a country populated only by nomad tribes which wander over it with large herds of cattle and flocks of goats and sheep. The farther North one gets, the lower, dryer and more nearly desolate does the country become, till near Lake Rudolph it is a desert of lava rocks and dust, and



U. S. Department of Agriculture

See page 81

*Hybrid Amaryllis in the collection of the United States Department
of Agriculture*

Plate 49

Flower uniformly colored red.



U. S. Department of Agriculture

See page 81

*Hybrid Amaryllis in the collection of the United States Department
of Agriculture*

Plate 50 White finely penciled with pink; flower 11" diameter.

only for a month or so each year is there any vegetation or water. And up from this grim country on the edge of the lake, which lies at about 1250 ft., stands a miniature range of mountains named Nyiro running up to 9,200 ft., with the upper 2000 ft. covered with a dense forest of beautiful Podocarpus and Juniper trees interspersed with many other species, and a lush vegetation and a rich flora. We climbed up precipitous tracks to the top, but unluckily we were too late in the year for the bulbous plants, and found no single amaryllid in flower.

At the foot of the mountain I found dried foliage of what may have been *Crinum amnocharioides*, and dug down to the necks of big bulbs, but they were too big and too deep and we had not enough time to excavate (the only word suitable to the task!) deeply enough to get them out. Higher on the mountain we saw another *Crinum*, larger with very wide leaves, possibly *C. giganteum*, rather than the ubiquitous *C. Kirkii*. These were in a rather difficult place, and feeling sure we should meet others we left them, but alas! never another did we see.

Higher up the bulbous plants were many, but all of the Irideae, such as *Gladiolus*, *Dierema*, *Aristea* and *Kniphofia* in great quantity; also many ground orchids, but no amaryllids.

The seeds so kindly sent me by the Amaryllis Society last year have all germinated wonderfully—*Hippeastrum* hybrids, a small “*Hippeastrum* species, pink”, *Zephyranthes citrina*, and *Cooperia*, also the Ragioneri strain of *Freesias*—and are all growing well.

Nairobi,
August 13, 1936

NEWS-NOTES FROM GERMANY

To the members of the American Amaryllis Society:—

I tried to get an account of the history of the Bornemann strain. I wrote several people about it. As far as I know now most of Bornemann's plants were sold after his death to a certain Mr. Schumacher at Naumburg who at that time was one of the best breeders of amaryllis in Germany. From this man Mr. Kunert, formerly director of the Imperial Gardens at Sans Souci, bought some plants, and formed quite a good collection. Unfortunately after the Great War these plants were sold and apparently are now lost. They were bought by the firm Kayssner at Zossen which shortly after went bankrupt. Mr. Weigel (of Weigel & Co., Erfurt) secured a few plants too from Mr. Kunert of the Bornemann strain. He raised a great number of plants, and to-day has one of the best collections of such hybrids in Germany. Mr. Gude at Berlin-Britz and Mr. Winter at Mariendorf near Berlin have some good amaryllis too but so far as I know their plants cannot rival those that I have seen in England and Holland, and what, I suppose, you have in the U. S. A.

With my best wishes for the American Amaryllis Society, I am,
very sincerely yours

Berlin—Charlbg. 9,
May 8, 1937.

(Signed) CAMILLO SCHNEIDER

THE 4TH NATIONAL AMARYLLIS SHOW, LOS ANGELES, CALIF.,
SEPTEMBER 23, 1937

On account of the frost damage to the above ground parts of amaryllids during January 1937 in California the scheduled National Amaryllis Show in April at Montebello, California, has been postponed for one year. This Show will be held in 1938 as the 5th. National Amaryllis Show.

Later in the season, arrangements were made to hold the 4th. National Amaryllis Show in the fall on September 23, 1937, in cooperation and in conjunction with the Los Angeles County Fair (Sept. 17 to Oct. 3, incl.).

Inquiries concerning entries should be addressed to Cecil Houdyshel, La Verne, Calif., who has been designated as the Society's official representative for the Show. Class 14 has been created for amaryllid exhibits, including the lot numbers as indicated below,—

CLASS 14—AMARYLLIDS

Awards to be 1st., 2nd., and 3rd prize ribbons, and a special certificate. If required, assistance will be given in classifying as to species, etc., upon arrival at the fairgrounds.

Lot No.		Lot No.	
1542—	Habranthus species and Dwarf Hippeastrums	1555—	Crinum capense (longifolium)
1543—	Habranthus and Dwarf Hippeastrum hybrids	1556—	Crinum Moorei
1544—	Lycoris aurea	1557—	Crinum Powellii
1545—	Lycoris radiata	1558—	Amaryllis belladonna
1546—	Lycoris squamigera	1559—	Alstroemerias
1547—	Zephyranthes candida	1560—	Bomareas
1548—	Zephyranthes carinata	1561—	Hemerocallis (Daylilies) species
1549—	Zephyranthes citrina	1562—	Hemerocallis hybrids
1550—	Zephyranthes robusta	1563—	Nerine species
1551—	Zephyranthes rosea	1564—	Nerine hybrids
1552—	Zephyranthes ajax	1565—	Any other amaryllid not otherwise specified
1553—	Hymenocallis species		
1554—	Crinum asiaticum		

Sweepstakes—For the largest and most varied display as part of the exhibit, including only lots within the division Special American Amaryllis Society Certificate.

FIRST WILLIAM HERBERT MEDAL AWARD

During the 4th. National Amaryllis Show, at 11 a. m., on September 23, 1937, the first award of the William Herbert Medal, illustrated in Plate 48, will be officially made. The committee was unanimous in making the first award to Mr. Arthington Worsley, of Ventnor, Isle of Wight, England, in recognition of his outstanding contributions to the advancement of the amaryllids. The presentation will be made by the Society's official representative, Mr. Cecil Houdyshel, and in the absence of Mr. Worsley, the medal will be received by the British Consul at Los Angeles, for forwarding to Mr. Worsley.

THE 5TH NATIONAL AMARYLLIS SHOW 1938

The Board of Directors has awarded the 5th. National Amaryllis Show to Southern California to be held in the Spring of 1938. The arrangements will be made by Mr. Fred H. Howard, Vice-President of the Society. For details about the show write to Mr. Howard at Montebello, California.

THE 6TH NATIONAL AMARYLLIS SHOW, 1939

The 6th. National Amaryllis Show has been awarded to New York City, and plans are being made to hold it in cooperation with the International Flower Show in New York City during the World's Fair.

SOUTHEASTERN REGIONAL AMARYLLIS SHOW IN 1938

The Southeastern Regional Amaryllis Show will be held in early April in Florida. Further announcements will be made through the local and horticultural press.

AMARYLLIDS AT THE 24TH ANNUAL INTERNATIONAL FLOWER SHOW, NEW YORK, MARCH 15-20, 1937

I. W. HEATON, *Florida*

The International Flower Show held at the Grand Central Palace, New York, March 15th to 20th contained many items of interest for the amaryllis enthusiast during the entire week. In the competitive classes, staged Monday to Wednesday there were a few really outstanding types. Mr. S. A. Savage, Glen Head, L. I., was awarded *First Prize* in the 12 plant class, his exhibit containing imported bulbs, included two of the three best amaryllis shown during the week. One a nine inch compact Leopoldi Salmon, the other of the same type in medium red, were the best among the private exhibits. These two plants had substance and remained in good condition until Saturday. The *Second Prize* went to Mr. and Mrs. John M. Schiff, Oyster Bay, L. I. This exhibit was also composed of imported bulbs.

In the 6 plant class, Mr. and Mrs. Marshall Field of Huntington, L. I. was *First*; with Mr. J. P. Morgan placing *Second*.

On Wednesday night after the close of the show for the evening Mr. Galliss and Mr. Chadburn staged the displays in the 50 foot classes. Mr. Galliss, Supt. for Mr. and Mrs. Marshall Field was awarded *First* and Mr. Chadburn, grower for Mr. S. A. Savage was *Second*. Mr. and Mrs. John M. Schiff had the best collection in this class but it was very poorly staged.

Mr. Marshall Field's collection is of English origin, and his varieties *Rose Velvet* together with the crosses,—*Daphne* x *Defiance* and *Admiral Drake* x *Rose Velvet* introduced some pleasing shades of light rose.

It was my good fortune to be able to spend an afternoon at Longwood, Mr. Pierre S. du Pont's estate, in company with Mr. Wm. Mullis, Supt. This collection must include nearly 10,000 plants, which as they flower are transferred from the growing house and beautifully staged among the other plants in the display houses. Mr. Mullis by departing from the standard practice of amaryllis breeding—crossing flowers of similar color—has produced some wonderful results by using pure white pollen on the lighter shaded solid color types. Space does not permit me to describe the many worthwhile varieties but one interested me so much, in fact I think it is the best Amaryllis I have ever seen. Mr. Mullis produced this variety by crossing pure white on light red. The flower was good size, at least nine inches, very flat Leopoldi type, the petals pointed and slightly twisted at the tips, color pure white, very faintly shaded with minute specks of light pink. The coloring extended only from the corona to the break of the throat, appearing as a dusting of color on a white base, giving the flower a faint blush pink.

This collection is without doubt the finest in the world today, and Mr. du Pont cannot be praised too highly for his judgment in assembling stock and the breeding methods adopted which have produced these noteworthy color variations.

THE 1937 AMARYLLIS SHOW OF THE BUREAU OF PLANT INDUSTRY, U. S. DEPARTMENT OF AGRICULTURE

The twenty-fourth annual Amaryllis Show of the U. S. Department of Agriculture was held at the Department Greenhouses, Fourteenth Street and Constitution Avenue, N. W., Washington, D. C., from March 27, to April 4, 1937, inclusive, being open each day from 9:00 a. m. to 9:00 p. m. The display was viewed by 21,027 people, including classes from public and private schools, members of garden clubs, and out-of-town as well as local florists and commercial growers.

The exhibition comprised 1,260 amaryllis bulbs, each of which bore two or three flower stems, some more than two feet long, with from two to seven flowers on each stem, making a display of several thousand flowers ranging in color from dark velvety red through various shades of red, pink, orange, yellow-orange and striped types to pure white. A number of the blooms measured eleven inches from tip to tip.

The plants were arranged in the exhibition house on two side benches and on a center elongated pyramidal staging. Small pots of *Vinca major* with rounded grey-green leaves edged with white were placed between the pots of amaryllis to form a pleasing combination with the pointed dark green leaves, thick silvery green flower stems and clear bright blossoms of the amaryllis. Several large pots, each containing a group of bulbs in flower, were placed along the ridge of the center staging to provide accent notes.

There were suspended from the roof of the exhibition house twenty-five baskets of *Streptosolen Jamesonii*, whose small, orange, trumpet flowers added to the general appearance of the exhibition.

The bulbs in the Department's collection of amaryllis are hybrids resulting from many years of breeding conducted by Department of Agriculture experimenters since 1909 when twelve varieties were imported from England. The Amaryllis Shows are exhibitions of the results achieved by the Department in one of the many phases of its work to produce improved forms. Department workers with amaryllis have successfully endeavored to obtain longer stems, new shades and larger flowers. The white amaryllis was produced through successive selection and cross-pollination of striped flowers showing the most white. A group of seedlings, flowering for the first time this spring, revealed new subtleties of color, particularly in the orange and red shades. Two seedling varieties included in the collection are illustrated in Plates 49 and 50.

The Department has held an Amaryllis Show each year since 1912 with the exception of the years 1914 and 1915.

AMARYLLIDS AT PHILADELPHIA FLOWER SHOW

JOHN F. RUCKMAN, *Pennsylvania*

The following report of awards in the amaryllid classes at the Philadelphia Flower Show, March 8 to 14, 1937, has been prepared with the assistance of the Pennsylvania Horticultural Society and B. B. Starkey, Secretary of The Philadelphia Flower Show, Inc.,—

In the class of hybrid amaryllis, *six plants*, there were three entries: Mr. Arthur H. Lea, Chestnut Hill, Pa., Gardener William H. Starke, Jr., *First Prize*; Mrs. Bruce Ford, Chestnut Hill, Pa., Gardener William Monroe, *Second Prize*. Only two prizes were offered in this class. The third entry was that of Mrs. Ernest du Pont, Wilmington, Delaware, Gardener Samuel Allison.

In the class for cut amaryllis, twelve spikes, Mrs. Bruce Ford, Chestnut Hill, Pa., Gardener William Monroe, was the only entry and was awarded *First Prize*.

Mr. Robert H. Jewell's amaryllis seedling was a special entry and was not in competition, but was awarded a *Certificate of Merit*.

In the Class for narcissus, three pots, three varieties, Mrs. William M. Potts, Wyebrooke, Pa., Gardener Alexander Handling, was awarded *First Prize* and Mrs. Ernest du Pont, Wilmington, Delaware, Gardener Samuel Allison, *Second Prize*.

In the Group of narcissus covering twenty-five square feet, Mrs. William M. Potts, Wyebrooke, Pa., Gardener Alexander Handling, was awarded *First Prize* and was the only entrant.

Mrs. J. Emmot Caldwell of Bryn Mawr, Pa., gardener John W. L. Gatenby, was awarded a *Certificate of Merit* for a *Clivia miniata* which was not in competition. This was an unusually well grown specimen, the main plant and two offsets each with an enormous cluster of bloom. Mr. Jewell's seedling amaryllis, a large dark red, was also very fine. A few *Eucharis grandiflora* were shown both as cut flowers and growing plants in various decorative displays. The outstanding hybrid amaryllis at the show was used as a decoration in the commercial display of Hosea Waterer of Philadelphia. This was a fine large flowered bright pink, somewhere between watermelon and begonia in shade, a clear, even color with no markings of any kind, as striking as it was unusual.

AMARYLLIDS AT THE 1937 JACKSONVILLE (FLA.) FLOWER SHOW

MRS. W. E. MACARTHUR, *Florida*

The display of hybrid amaryllis at the Jacksonville Flower Show was very creditable considering that most of the choicest varieties in this area were forced into bloom before the scheduled date of the Show, April 15th and 16th, 1937 by the unusually warm weather conditions of the past winter.

Mrs. W. G. Tilghman, Palatka, Florida, contributed a colorful display of choice blooms which were appreciated by hundreds of interested spectators during the two days of the Show.

The first prize went to a lovely specimen of six bells of white with pink markings exhibited by Mrs. Millar Wilson.

A wonderful dark red hybrid amaryllis of four bells grown by Mrs. J. H. Churchwell was awarded the second prize.

Many varieties of early blooming hemerocallis were exhibited showing an increasing interest in this versatile garden plant. Another amaryllid noted at the show was *Crinum Powellii album*.

DAFFODIL NOTES 1937

MARY McD. BEIRNE, *Virginia*

To one who has fallen victim to the habit of attending Spring Daffodil Shows, there is an absorbing interest in watching the gradual ascent to popularity of varieties one has grown. Likewise, it is equally diverting to observe these same flowers give place to others of obvious superiority, and to study the reasons why.

For the past several seasons de Graaff's *Aerolite* has been steadily climbing to first place among the class of Yellow Trumpets. There are other flowers of very high quality in this class which as yet are unavailable to the gardening public. Brodie's *Hebron* is one of these—bred from *White Emperor* by *King Alfred*. It has inherited the best quality of each parent, taking fine form from one and pure deep *King Alfred* yellow color from the other.

Lord Antrim is another Yellow of superb stature and clean bright color. Van Tubergen's *Apotheosis* and *Dawson City* continue in popular favor, bringing quiet beauty to the Show table, as well as providing lovely spots of clear soft yellow for the garden.

Beersheba has for the moment yielded first place in the White Trumpet class to *Tain* and *Slemish*. The former flower is a pure white of very great beauty, bred from *Beersheba*. As yet it is prohibitive except for the collector. *Slemish*, another child of *Beersheba*, is making its presence felt not only for Show, but as a garden decorative of high quality. The flower is tall and straight; of good form and a clear, pure two-toned white which is cool and captivating.

The universally popular *Mrs. Krelage* and its running mate, *Mrs. Robert Sydenham*, two good garden whites, continue to make their annual appearance. *Driven Snow* is always amazing in its snowy whiteness. Other glistening whites, of high quality, are *Corinth* (which perfects its color indoors) and *Everest*.

Bicolor Trumpets were represented mainly by those varieties which have proven as hardy as they are lovely. *Sylvanite* and *Moirra O'Neill* have withstood this test. *Tapin* and *Halfa* are still Trump cards for the Star exhibitor.

Among Bicolor Incomparabilis, several fine specimens of P. D. Williams' bright colored *Afghanistan* were conspicuous in several blue ribbon Collection classes. This flower is slightly drooping, with wingy perianth of soft creamy yellow; and a long glowing crown of deep orange color.

Bodilly is always in evidence, a good flower of fine form and clear-cut white and yellow color. But specimens exhibited on this side of the Atlantic are pigmies compared with plants grown overseas. This variety makes little effort to conceal its displeasure at being transplanted to American soil.

Two charming Yellow Barriis noted were *Alcida* and *Red Sea*. The former has a telling citron-yellow cup with orange frill. Additional fine qualities of good height and vigorous increase contribute to the

growing popularity of this splendid show and garden variety. *Red Sea* is an excellent example of the brilliance of clear yellow, set off by a crown of solid deep red.

Mr. P. D. William's *Kennegie* was outstanding among the class of Bicolor Barriis. The broad white pointed petals and perfectly flat crown with wide margin of deep red, was a glowing spot of color, even among other highly colored flowers of its class.

Rosebud, another seedling of Mr. P. D. Williams raising was especially lovely; purest white with a deep orange eye.

Tenedos, as usual, took first place among the class of Giant Leedsii with *Irish Pearl*, *Gracious* and *White Sentinel* clamoring for a share in the honors. Mr. Engleheart's *Still Waters* was enchantingly lovely; a flower of icy whiteness, with just the faintest suspicion of rosy pink in its crown.

In the Poeticus group, *Actea* is still a prime favorite, possibly because of its large size and bright scarlet eye. *Dinton Red* was a brilliant bit of glowing color; while *Ace of Diamonds* is still unsurpassed as the gem of its class with eye of blazing hot scarlet throughout.

DAYLILY MEETING IN PROVIDENCE, RHODE ISLAND

MISS MARY E. DAVIS, *Rhode Island*

On June, the nineteenth, a group of hemerocallis enthusiasts met in Providence, Rhode Island, by invitation of Mr. George DeWitt Kelso. After a luncheon, the daylily beds at Roger Williams Park which are under the care of Mr. Kelso were visited and a list of daylily varieties in the collection was distributed to those present.

A round table discussion on "Evaluation" was held in the Park Museum Building, presided over by Mr. Kelso who showed pictures of his blooms and described his recent visit to Dr. Stout of the New York Botanical Garden. Letters and articles were read and various phases of the subject considered. The consensus of opinion was that there were too many new varieties of insignificant value.

Growers and others interested are urged to score hemerocallis plants using the designations adopted last year—

discard
poor
x *good*
xx *very good*
xxx *excellent*

All data should be sent to Mr. Kelso, 184 Washington Street, Providence, R. I., by September.

The results of some experiments concerning fragrance of daylilies were presented and a tentative classification of hybrid daylilies was proposed.



CAROLUS Å LINNÉ JUN. M. D.
*Medicin. & Botanic. Professor Ups.
Reg. Societ. Medic. Hospitum. &
Montpeliers. Memb.*

From Hedin's Minne af von Linné, Fader och Son, 1808. See pp. 91 and 100

Carl Linnaeus, the Younger

Plate 51

purpurea Amaryllid? spatula subbiflora, corollis erectis
 li' basi tubulosis, fauce tubi glabris, ~~scapo~~
~~foliis brevibus~~ foliis linearibus lanceolatis

Crinum speciosum, suppl.

Habitat in Africa Australi: Cap. B. 1791. Marf.
 bous alig. specimen fideur in Herbario B.

folia ultra pedalia, ~~per~~ uniuersam lata, linearia, apicem versus
 parum attenuata, obtusa, nervosa

scapus foliis brevior, compressus fistulosus

spatha duplex; foliola lanceolata, erecta, obtusiuscula, biflora

descriptio Am. athenas ex specimenis viis

Folia ^{paucis} To ad 12 peniam longa, vix ultra lineam lata, flauida,
 linearia, plane, glaberrima, obtusa,

scapus sex unciali, foliis paulo latior, erectus, compressifolius,
 solitus, glaberrimus, basi nuperscens, postea viridi

spatha monosylla, cylindrica, purpurea, latere oumpens, oblongo-
 ovata, purpurea.

flor erectus pedicellatus

pedunculus spathe dimidia brevior, tenax, rectus, erectus, viridi

germen breue, trigonum, vix pedicello s. tubo latius, viride, erectus

corolla ^{tubus} constab ex angulis petalorum sex connatis quodam quartam
 partem corda, in ^{tubum} obsolete triquetrum, trifidum, incurvatum

seppim in limbum infundibuliforme comparsulatum: lacini
 limbi lanceolata elliptica, ^{lineati} ^{altiori} hes (exterior paulo maiores, interiores ma-
 gine

centimeters

1

2

3

4

5

Spencer Savage, England

See page 94

Specimen pages, manuscript by the Younger Linnaeus dealing with
 certain genera now included in the Amaryllidaceae; approximate
 date of composition, September 1782 to November 1783

Plate 52

2. COLOR DESCRIPTION

PHOTOGRAPHING FLOWERS IN COLOR

GEORGE W. HESSE,

E. Leitz, Inc., New York, N. Y.

Flowers and other parts of plants never look so well in print as when natural color processes are used to reproduce every delicate nuance of hue inherent in the original. Natural color photography has made many advances in recent months, methods and procedures having been improved to a remarkable degree. In the newest film available, Kodachrome, there is little to be desired so far as color rendition, emulsion speed, and range of uses are concerned. For still work, this film is at present available only in the 35 mm. size for cameras such as the Leica.

Unlike previous natural color processes, neither a geometical screen nor special taking filters are required in order to produce the colors. The separation of colors is brought about within the body of the emulsion itself, being accomplished by coating the film support five times; consisting of three coats of color sensitive emulsions, which are separated by two coats of plain gelatin. Each of the three coatings of emulsion is selectively sensitized—that adjoining the film support is red sensitive; the center coating is green sensitive; and the outer, top, coat is sensitive to blue-violet. The two layers of plain gelatin prevent the sensitizers of emulsions from straying away from their respective coatings. The overall thickness of these five layers is no more than that of the emulsion of ordinary black and white negative material.

When an image is focused upon Kodachrome film, some part of the picture is formed in each of these three layers, depending upon the color of the subject: red colored objects in the picture are recorded by the bottom, red-sensitive layer; green colored objects by the center, green sensitive layer; and blue colored objects by the top, blue-violet sensitive layer. After the film is processed by the reversal method, each of the three coats of selectively sensitized emulsions is dyed with color complementary to its original sensitivity. The bottom, red-sensitive emulsion is dyed blue-green. The center, green-sensitive coat is dyed red (magenta). And the top, or blue-violet sensitive layer is dyed yellow.

During the processing the metallic silver image is dissolved and thus removed, leaving a pure dye image reproducing beautifully all colors of the original. Because the three emulsion coatings can be sensitized selectively it is possible to balance the film for either daylight or artificial light.

The Kodachrome Regular (K135) is prepared so as to give a correct color rendition under daylight conditions. In the mountains at high altitudes and under certain other conditions there may be a preponderance of ultra-violet light which may photograph on the Kodachrome film as violet. To correct this, the Kodachrome haze filter (requiring no increase in exposure) should be used. If necessary, the same film may be used for photography under artificial light by the use of a blue Koda-

chrome filter. This filter, however, necessitates an increase in exposure of 4 times over normal.

For photographs in artificial light the Kodachrome Film Type A (K135A) has an emulsion specially corrected for use with photoflood and photoflash bulbs. It should be used only with this type of illumination for high wattage tungsten bulbs will make the picture too red while the so-called blue daylight bulbs will make the picture too blue. For use in daylight it is necessary that a reddish-yellow Type A Kodachrome filter for daylight be used so as to change the quality of daylight to that of artificial light.

It should be borne in mind that the scene itself produces its own color contrast and when photographing a picture the scene should be illuminated by flash light. Under artificial light the best results will be secured by so arranging the lights that 60 per cent of the illumination will come from one side with about 40 per cent from the other.

The entire range of Leica accessories can be used for making color pictures for the Kodachrome emulsion is the most sensitive color film which has yet been produced. Color macro-photographs can easily be made of portions of plants by using the Leica in conjunction with either the sliding focusing copy device or the rotating focusing stage. When examined by projection these pictures reveal unsuspected hidden beauty.

While the usual method is to project color transparencies by means of a Udimio or Umena Projector, the aim of all natural color photographers is to reproduce their color pictures on paper. Though Kodachrome produces a colored transparency it is possible to use this positive as a master from which to make separation negatives by means of filters L-50, N-61 and F-29. These negatives can then be used to make the prints by one of the color printing processes such as Chromatone, Eastman Wash-Off Relief, Trichrome Carbro, Bellecolor, Duxochrome, Colorstill and the like.

MEINHARD ON "COLOR PRINTS"

Under date of February 15, 1937, Mr. P. R. Meinhard of the Eastman Kodak Company, Rochester, N. Y., writes as follows,—

Kodachrome transparencies can be used as a source for color separation negatives, from which, in turn, prints can be made on Eastman Wash-Off Relief Film. The three-color negatives are made through red, green, and blue Wratten filters (Nos. F-29, N-61, C4-49). Exposure may be made by contact or projection on a panchromatic material such as Wratten Panchromatic Plates or Eastman Portrait Panchromatic Film.

If the lens in the enlarger is not sufficiently color-corrected to make satisfactory separations, it might be advisable to make the original three negatives by contact. Exposure may then be made by projection from these negatives onto wash-off relief film.

In printing from these negatives, it will be necessary to expose through the No. 35 violet filter. Exposure may be made through the tri-color filters mentioned above, with either tungsten or photoflood illumination. We would not recommend the argon tube illumination for either making the separation or for printing on Eastman Wash-Off Relief Film. We see no reason why satisfactory enlargements up to 11x14 cannot be made by the above means.

COLOR DESCRIPTION OF *HEMEROCALLIS FULVA ROSEA*

The value of a color chart in the description of flower colors is illustrated in the case of *Hemerocallis fulva rosea*. The color differences are so subtle that a simple color chart is not sufficient and Marez and Paul "A Dictionary of Color" was used—

The general aspect of the flower is brighter than that of the type, and the other fulvous varieties. The eye zone is near to Red Cross Red (4-L-6), and the portion of the petaline segments above this zone is a red between Old Coral or Jasper Red (3-J-10) and Mephisto Red (3-K-10) with a very narrow pink band in the center of the segment. This is a delicate pink (3-K-7) between Laurel Pink and Carnival Red. The portion below the eye zone is light-greenish very near to Chalcedony Yellow (18-J-1). The lower one-third of the sepaline segments is similar to the description just given. The color then begins with Raspberry Red (3-K-9) changing gradually to Ibis Pink (1-B-10) and finally to Honey Dew (9-B-8) at the extreme edges of the tip.

The style is Chalcedony Yellow at the base changing to very light pink and then to light Mephisto Red and finally again to Chalcedony Yellow at the tip. The filaments are Chalcedony Yellow at the base changing to Mephisto Red, and the unopened anthers are fulvous brownish-red.

Mira Flores,
May 29, 1937

HAMILTON P. TRAUB

THE R. H. S. COLOR CHART

As announced in the 1936 *Herbertia*, the Royal Horticultural Society has in preparation a color chart for horticultural purposes. This promises to be the most adequate and convenient color chart that will be available for some time, and it is also quite inexpensive. For these reasons the Board of Directors of the Society is taking steps for its official adoption as soon as issued. Further details will be supplied in the 1938 *Herbertia*.



R. A. Dyer, Pretoria

See page 121

UPPER, *Crinum Forbesianum*; LOWER, *Buphane disticha*

3. DESCRIPTION AND PHYLOGENY

ON A MANUSCRIPT BY THE YOUNGER LINNÆUS DEALING WITH CERTAIN GENERA NOW INCLUDED IN THE AMARYLLIDACEAE

SPENCER SAVAGE, F. L. S. *England*

Carl Linnaeus the younger—known to botanists by the abbreviation *Linn. fil.*,—was born on 20 January 1741 at the home of his maternal grandfather at Falun, in the province of Dalecarlia, Sweden. He was only twelve years of age when his father published his most important book, the “*Species Plantarum*”; and as the only son of the most celebrated living botanist it might be thought that his happiness and success in life would have been well assured. Nevertheless, in spite of his father’s care and encouragement of his education; placing him under the tuition of some of his best university students and giving him copies of his own and others works, (the inscriptions in some of which still bear witness to his paternal love), the younger Linnaeus grew up to a somewhat unhappy manhood. Several factors contributed to this unhappiness. His father’s overshadowing greatness was undoubtedly one; the comparisons that were all too readily made by those who resented his advancement just because he was Linnaeus’s son (he was called by some “the young Dauphin”) was another; but above all was the extraordinary dislike, amounting to hatred, shown to him by his mother. (See portrait, Plate 51).

Unhappiness, however, did not prevent his becoming a good naturalist. When eighteen years of age he was appointed demonstrator in the University Botanic Garden, Uppsala; and in a few years had published his “*Decas prima (secunda) plantarum rariorum horti Upsaliensis*” (1762-63), illustrating the work from his own drawings. In 1763 he was appointed adjunct-professor of botany in Uppsala University; and in 1765 the degree of doctor of physic was conferred on him. Although not inheriting his father’s great genius he became a very competent naturalist, as his published works and the considerable amount of surviving unpublished MS. material amply prove. During the last year of the elder Linnaeus’s life, the son was made professor of botany at Uppsala, as the father was then through illness unable to do any real work. After his father’s death on 10 January 1778 he inherited the title of von Linné, but was compelled to purchase from his mother and sisters the valuable collections of animals, plants and minerals made by his father. On obtaining these, which together with a library of printed books and manuscripts became known as the Linnaean Collections, he worked very hard to preserve them and to carry on his father’s work. In botany, that work resulted in the publication of the “*Supplementum Plantarum*” in 1781, a book containing new descriptions by both father and son.

In the spring of 1781, the younger Linnaeus left Sweden for a visit to England. On reaching Newcastle-upon-Tyne he was made welcome by an old friend, John Rotheram¹, the only English student of the elder Linnaeus and one of the two persons present when he died. Reaching London about May, the son of Linnaeus was given a warm welcome by Sir Joseph Banks, Daniel Solander and others, who did all they could to help him. It was in London that he began the MS. dealt with here, as well as one on the genera of palms. Whilst in this country he visited many of the famous gardens in or near London, including the Royal Garden at Kew.

In the English translation of Stoeve's life of Linnaeus and also in Sir James Edward Smith's article on the younger Linnaeus in Rees's Cyclopaedia the statement is made that this English visit lasted only four and half months, but from documents found among the Linnaean MSS. it seems certain that the younger Linnaeus remained here for about sixteen months, although he may have visited France for a short time in 1781. Unfortunately, although a strong and vigorous young man he had a bad attack of jaundice after reaching London, which incapacitated him for about two months. It is stated that Sir Joseph Bank's botanist and librarian, Daniel Solander, nursed his fellow-countryman during that illness.

On leaving England, he visited France, Holland, Germany and Denmark, returning to Uppsala in February 1783. After resuming his duties at the University, he became ill with a bilious fever, which culminated in an apoplectic stroke from which he died on 1 November 1783 in his forty-third year. He was buried in Uppsala Cathedral at the side of his father; and, being the last male heir to the title, the family coat-of-arms was broken over his grave.

The younger Linnaeus is stated to have been a man of agreeable and unassuming manners and to have been much liked by his contemporaries. He is also credited with an excellent memory, and his keen and penetrating eyes are said to have resembled those of the great Linnaeus. Unlike his father, he knew English well enough to speak and write it fairly well; and probably for that he had to thank his friend John Rotheram, who had spent quite a long time at Uppsala, had learned Swedish, and was a frequent visitor at Linnaeus's house.

The MS. which is the subject of this paper came into the possession of The Linnean Society of London with the Linnaean Collections when they were purchased in 1829 from the executor of Sir James Edward Smith, its first president. (In 1783 Smith had purchased the Collections from Linnaeus's widow, to whom they had reverted on the death of the younger Linnaeus.) In size the MS. measures 16 x 9.5 cm. and comprises 150 leaves, out of which only 196 pages have been written upon. Sir James Edward Smith wrote the following title on the outer wrapper: *Linn. fil. MSS. de Liliaceis et affinibus plantis*. From internal evidence the MS. can be roughly dated as between 1 September 1782 and 1 November 1783, as on fol. 65 the author states that he saw 'Pancratium fulvum' in flower at the Paris Garden on the former date. It is prob-

¹ He became professor of physic at the University of St. Andrews, Scotland.

able, however, that the MS., which would have been a gradual compilation, was commenced during his stay in England and laid aside before his return to Uppsala. Therefore, it may be dated 1781-82.

The following genera are dealt with:—*Haemanthus*, *Narcissus*, *Pan-cratiun*, *Crinum*, *Agapanthus*, *Amaryllis* and *Eucomea*; followed by generic diagnoses only of *Aletris*, *Veltheimia*, *Hyacinthus* and *Lachenalia*; ending with a specific diagnosis of *Lilium longiflorum*. The MS. is obviously incomplete, and it is now impossible to tell how much more the author intended to include, as he left no plan for the complete work and no title that might have given a clue.² It will be at once noticed that here are included three genera that were not published until after the younger Linnaeus's death,—*Agapanthus*, by L'Héritier in 1788; *Eucomea*, by R. A. Salisbury in 1796 (L'Héritier's *Eucomis* in the 'Sertum Anglicum', 1788, is the same genus); and *Lachenalia*, by Jacquin in 1787. The explanation of this is simple: the source from which these authors derived the names was Solander's MSS., where much of Solander's work remained unpublished. Charles Louis L'Héritier published his 'Sertum Anglicum' after a visit to England; and Salisbury not only had access to the Solander MSS. but through Sir James E. Smith was able to examine and cite in his 'Prodromus stirpium in horto ad Chapel Allerton vigentium', Londini, 1796, this MS. of the younger Linnaeus, which, however, he does only for five species.

Another work, Aiton's 'Hortus Kewensis', 1789, has a more important bearing on this MS., as the following passage shows:—

'When the younger Linnæus was in England, in 1781 and 1782, he composed a treatise on the Palms and Liliaceous Plants, extracts of which, as far as was thought likely to be useful to this Catalogue, he communicated to the Author; this Manuscript is quoted under the abbreviation of *Linn. fil.*' (Vol. 1, p. vi).

I find that twenty-seven of the specific diagnoses in the MS. under consideration were printed with the authority *Linn. fil.* in the first edition of the 'Hortus Kewensis', as well as generic diagnoses of *Crinum*, *Agapanthus* (though not marked *Linn. fil.*), and *Amaryllis*. (These have been noted in the following list.) Nevertheless, in the second edition of 'Hortus Kewensis' (1810-13) all reference to the younger Linnaeus disappears from the preface, and instead of his authority against certain genera and species Willdenow's name has been substituted. In nearly all cases the diagnoses remain verbally the same.

Fortunately, the history of the 'Hortus Kewensis' was dealt with in some detail by the late James Britten, F.L.S.³; and from his account it is clear that Jonas Dryander, Sir Joseph Bank's librarian, was the editor of the first edition and of the earlier portion of the second edition. Dryander would have made full use of the Solander MSS., connected with the Banksian herbarium, in preparing the book for the press; and without doubt he must have accepted the authorship for the twenty-seven

² See page 94, footnote.

³ J. Britten, 'The history of Aiton's Hortus Kewensis', *Journal of Botany* (London), vol. 50, Suppl. 3, 1912.

species mentioned here. Nevertheless, in 1803, in a reply to a letter from W. T. Aiton, son of the nominal author, asking for help in preparing the proposed second edition, Dryander wrote:

‘I shall be very ready to give you all the assistance in my power in publishing a new edition . . . But before we proceed to put it in execution it will be necessary to have a conference with Sir Joseph Banks, to determine upon what alterations the edition of Willdenow’s *Species Plantarum* and other new books may make expedient particularly in regard to synonyms and differentiae specificæ—’⁴

What passed at that conference is not recorded, but one feels a great regret that this MS. of the unfortunate younger Linnaeus was not published as a complete work before his death. At any rate, the citations to Willdenow’s ‘*Species Plantarum*’ in the second edition of the ‘*Hortus Kewensis*’ are manifestly incorrect, because in Willdenow’s book these species are ascribed to *Ait. Hort. Kew.* They should in every instance be credited to the younger Linnaeus.

The general plan of this work by the younger Linnaeus is a usual one in systematic botany: first, a Latin generic diagnosis, sometimes with added observations; secondly a Latin specific diagnosis, followed in many cases by a detailed description, for each species, with in some cases a copious synonymy. In one instance thirteen synonyms are given, referring in the main to illustrations with an added note as to whether they are good or bad ones. (See Plate 52). In addition, some species have interesting notes (one of which is in Swedish) added to the diagnoses. An unfinished work, the MS. has additional items such as the one shown in the lower portion of Plate 52.

In the following list of species dealt with in the MS., the manuscript name given by the author is placed first, followed, in round brackets by any important synonym or reference to a good figure cited by him. The habitats and sources of specimens are given in full as being of historical interest. My own notes on the MS. are placed in square brackets. A list explaining the abbreviations used is placed at the end of the article; taken partly from Dryander’s excellent list in ‘*Hortus Kewensis*’.⁵

Hæmanthus multiflorus. (Seb. Thes. 1, p. 20, t. 12, f. 1, 2, 3.) Habitat in Africa prope Serram Leonem. [Salisbury, Prodr., p. 217 cites this MS. name as a synonym of *H. colchicifolius*.]

H. puniceus. (Dill. Elth. 1, p. 167, t. 140.) Habitat in Africa Australi: Cap: b: spei. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 404.]

H. coccineus. (Comm. hort. 2, p. 127, t. 64.) Habitat in Africa Australi: Promont: Bon: spei. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 403.]

H. pubescens. (Suppl. Plant.) Habitat in Africa Australi: Promont: Bon: spei campis arenosis. [The name *H. hirsutus* was first given to the diagnosis, but has been deleted for the already published *H. pubescens*. Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 404.]

⁴ l. c., p. 6.

⁵ Since writing the above, a search amongst the uncalendered MSS. of the younger Linnaeus has brought to light another MS. which, so far as investigated, appears to contain some of the first drafts for the MS. considered in this article. This earlier MS. is a paper-covered notebook, 19.5 x 16 cm., 18 leaves. On its cover the younger Linnaeus has written LILIACEA, which may be translated ‘Liliaceous Plants.’



H. King, Pretoria

See page 122

Cyrtanthus contractus

Plate 54



Curtis's Botanical Magazine

See page 127

Nerine sarniensis

Plate 55

- H. pulchellus*. [Name deleted; no synonym cited.] Habitat in Africa Australi: Promont: Bon: spei. Masson. Specimen in Herbar: Dni Banks pro descriptione inservuit.
- H. ciliaris*. (*Amaryllis ciliaris* Suppl.) Habitat in Africa Australi: Promont: Bon: spei. Mas(s)on. Descripsi specimen in Herb: Dni Banks. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 404; Salisbury, Prodr., p. 217, has this species and cites *Amaryllis ciliaris* Suppl. as a synonym.]
- H. distichus*. (*Amaryllis disticha* Suppl.) Habitat in Africa Australi: Promont: Bon: spei. Masson. Descript: ex specimine sicci in Herb: Dni Banksi. E MSc^a Banks: Nomen Holland Vergift Boll. Hottentotti extracto radiceis aroma intoxicant, et inde venenum præparare quibus Antilopes occidant. Masson. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 405, but for *H. toxicarius*.]
- H. spiralis*. (*Crinum tenellum* Suppl.) Habitat in Africa Australi: prope Promontor: Bon: spei. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 405.]
- Narcissus Pseudo-Narcissus*. (Rob. icon. t. 242: *Narcissus sylvestris*.)
- N. bicolor*. (Rudb. Elys. 2, p. 70, f. 7, p. 71, f. 9.)
- N. minor*. (Rudb. Elys. [2,] p. 72, f. 11.)
- N. Tazetta*, α *polyanthos*, β *vitellina*. [Note in Swedish on the 'common Tazetta,' which translated* reads: 'I observed when in London that the pistil is very often so short in *orientalis* that it is not visible between the anthers as is the case in the common Tazettas. I wonder if this is correct.']
- N. calathinus*. (Park. Par. p. 68.) Obs: synonyma patris vix huc pertinent.
- N. papyraceus*. (Barr. icon. t. 916.) Vulgo Paper-White.
- N. concinnus*. (Barrel. f. 956.) [Salisbury, Prodr., p. 225, cites this MS. name as a synonym of *N. radiiflorus*, but with a query.]
- N. stellatus*. [Name deleted.] (Barrel. f. 957, 958; etc.)
- N. angustifolius*. (Hort. Eyst., Vern. IV, fol. 10, f. 3.) Habitat in Europa Australi.
- N. Bulbocodium*. (Hort. Eyst., Vern. 3, t. 13, f. 4.)
- N. odoratus*. Fig: mihi nulla visa, huic simile nisi Park. parad. t. 89, f. 5 ?; fig: certe mala.
- N. reflexus*. (Swert. Flor. 27, n. 4) Habitat in Europa Australi: in Lusitania prope Oporto.
- N. Jonquilla*. (Fl. Arag. No. 293.)
- Pancratium excisum*. Ex horto Marquis of Rockingham sub nomine *Pancratium caribæum commune*. Forte varietas *Pancr: charibæi*. Variet: *charibæi* Hortul: accepti. [Salisbury, Prodr., p. 226, cites this MS. name as a synonym of *P. amœnum*.]
- P. caribæum*. (Comm. Hort. 2, p. 173, t. 87.) Habitat in India Occidentali: Jamaica, Barbados. Vidi at [sic] Duchess of Portland.
- P. declinatum*. (Jacqu: amer., p. 99; hort. 3, p. 10, t. 11, *Pancratium declinatum*.) Habui ex horto Marquis of Rockingham in Wimblington [Wimbledon] sub nomine *Pancratium amboinense commune*.
- P. speciosum*. [The names *augustum* and *Rockinghamni* have been deleted.] (Raji Hist. III, p. 554, n. 4.) In Hort: Lord Rockingham in Wimbleton [Wimbledon]. Florentem vidi in mense Julii et in Martii. Obs: nullum hujus reperire potui figuram, nec patriam inquirere. Forte varietas *charibæi*; sed diverso tempore florens, et magnitudine omnium partium speciosior. Regina Plantarum Coronariarum, saltem nullæ in qualitatibus ab his nobis desideratis cedens. [Salisbury, Prodr., p. 227, cites this MS. name under the same name, *P. speciosum*.]
- P. expansum*. (*Pancratium amboinense* β , Syst. Nat.) Habitat in America? Vidi in Hort: Marqu: of Rockingham.
- P. amboinense*. (Comm. Hort. 1, p. 77, t. 39.) Habitat in Amboina? Nec specimen vel vivam vidi!
- P. littorale*. (Jacqu: amer: p. 95, t. 179, f. 94, floris; hort. 3. p. 41, t. 75). In Hort: Dni Pitcairn. Habui ex horto Marquis of Rockingham sub nomine *Pancratium caribæum verum*. [Salisbury, Prodr., p. 227, has this species under the same name and cites the same synonyms and the second source.]

* Lt. Col. A. Uggla, F.L.S., has kindly made this translation.

- P. carolinianum*. (Catesb. Carol. 3, p. 5, t. 5.) Habitat in America Septentrionali: Georgia. Ex Horto Lee.
- P. verecundum*. [The name *suaveolens* has been deleted.] (Rudb. Elys. 2, p. 88, f. 7.) Specimen siccum hujus vidi in Herb: Dni Banks a Koenig missum. Descriptionem secundum vivum specimen communicavit Dr Solander.
- P. fulvum*. [The name *tubulosum* has been deleted.] Habitat in Lima unde ad Hortum Parisinum missa ubi florentem vidi anno 1782 primo Septembris.
- P. zeylanicum*. (Comm. Hort. 1, t. 38.) Habitat in India Orientali. Specimen siccum in collectione Sloanea Mus: Britt:
- P. longiflorum*. (Forsk. desc. Plant. Arab. p. 72 ? *Pancratium maximum*.) Habitat in Ceylona. Specim: sicc: in Musae: Banksii. Obs: plantam quam describit Forsk: l. c. certe huic maxime affinie si non eadem. In specimine sicco, marginem Nectarii observare non potui.
- P. Ornithogaloides*. Habitat in Perou. In Herbario Dni Jos: de Jussieu. [Rough sketch of the flower.]
- P. clavatum*. Habitat in Perou. In Herbar: Dni Joseph. de Jussieu. Facie *Amaryll(id)is cernui*. [Rough sketch of the flower.]
- P. maritimum*. (du Bry Floril. t. 26, *Hemerocallis valentina*.) Specimen siccum unicum mihi visum in Musaeo Brittanico: Herb. Sloan: vol. 57, fol. 18. Varietas flore rubro vide du Bry Florileg: t. 59, *Narcissus major* s. *Pancratium floribus rubris*.
- P. illyricum*. (*Pancratium maritimum*, Sp. Pl. ed. 1.)
- P. mexicanum*. (Dill. Elth. p. 299, t. 222, f. 289). Figuram vidi Millerii in Museo Banksii ex planta in Horto Fothergill: factam. Obs: Hæc differt a Dillenii figura . . .
- Crinum*. [Generic diagnosis printed in Aiton, Hort. Kew. 1, p. 413.]
- Crinum americanum*. (Comm. plant. rar., t. 14.) Habitat in America?; Asia, Banks & Soland. In Caldariis Anglorum vulgaris. Pericarpium hæc descripsit Solander in Java. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 413.]
- C. erubescens*. (*Crinum americanum* β, Sp. Pl. p. 419.) Habitat in America; Java, Thunberg. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 413. Salisbury, Prodr., p. 230, cites *C. erubescens* Linn. fil. in Ait. Hort. Kew. as a synonym of *Amaryllis procera*.]
- C. asiaticum*. (Rhed. Hort. Malab. XI, p. 75, t. 38.) Habitat in Ceylona.
- Agapanthus*. [Generic diagnosis printed in Aiton, Hort. Kew. 1, p. 414, but the authority Linn. fil. omitted.]
- Agapanthus africanus*. (*Crinum africanum* Syst. Nat.) Habitat in Africa Australi: prope Prom: b: spei in monte tabulari et montibus adjacentibus. Variet in loco natalia α) flore saturate cæruleo β) flore dilute cæruleo.
- Amaryllis*. [Generic diagnosis printed in Aiton, Hort. Kew. 1, p. 415.]
- Amaryllis ornata*. (Rumph. Amb. V, p. 306, t. 105. *Tulipa Javana*.) Habitat in Africa: Guinea. Vulgo Cap-Coast-Lilly. Ex horto in Wimblington [Wimbleton], Lord Rockingham. Obs: figuram coloratam hujus vidi in Musaeo Dni Banks in patriae cura Smeathmanni facta. Plantam vivam ex horto Dni Rockingham habui. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 418.]
- A. latifolia*. (*Crinum latifolium*, Syst. Nat.)
- A. Equestris*. (Merian. Surin. p. 22, t. 22.) Angl: Martinique Lilly s. Barbados Lilly. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 417.]
- A. cernua*. (Plukn. Alm. t. 195, f. 3.) Habitat in Africa Australi locis paludosis prope Breed-Rivier. Fr. Masson. Descr. Soland.
- A. radiata*. (Trew. Seligmann. t. 35.) Figura Seligmanni facta Londini ab Ehret, sed ex minuto specimine. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 421.]
- A. obliqua*. Habitat in Africa Australi, circa Promont. Bon. spei, prope Cham-tours Rivier in campis graminosis. Fr. Masson.
- A. fucata*. Ex horto Marquis of Rockingham in Wimblington [Wimbleton]. Obs: longissimo tubo, et coarctito limbo differt a *A. longifolia* facile.
- A. longifolia*. (Comm. hort. 1, p. 71, t. 36.) Habitat in Africa Australi. *Amaryllis* descr: ex fig: picta Mill: Hæc forte planta varietas *A. latifoliæ*, cujus figuram dedit Rheed, a qua differt maxime numero florum, flores mi-

nones, rubri, lacinias non acutas sed obtusiores in reliquis conveniunt. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 419.]

A. revoluta. (? *Crinum lineare* Suppl.) Habitat in Africa Australi. Vivam vidi ex Horto Kewensi, cura Dni Aiton. Obs: Flos odore *Gardeniae floridae*. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 419.]

A. zeylanica. (Comm. hort. 1, p. 73, t. 37.) Patriam suae Africam dicit Erhet li. e. Ehret.]

A. purpurea. (*Crinum speciosum* Suppl.) Habitat in Africa Australi: Cap. b. spei, locis, uliginosis. Masson. Specimen siccum in Herbario Banks. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 417.]

A. miniata. Habitat in India occidentali: insulis Caribæis. Horto Dni Lee ad Hammarschmidt [Hammersmith] prope London. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 417, but for *A. reticulata*; Salisbury, Prodr., p. 233, cites this MS. name as a synonym of *A. reticulata*.]

A. falcata. (*Crinum falcatum*, Jacqu. hort. 3, p. 34, t. 60.) Habitat in Africa australi: Cap. b. spei. Thunblerg.] [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 418.]

A. falcata. Ex Sched: Solandri. Descriptio Massonii non Solandri. Habitat in locis sabulosis ad Promontor. b. spei.

A. Atamasco. (Trew. Seligmann, t. 37.) Habitat in America Septentrionali: Carolina. [Specific diagnosis, with the final word 'aequalibus' added, printed in Aiton, Hort. Kew. 1, p. 416.]

A. Atamasco. Descriptio Am: *Atamasco* ex specimine vivo. [See Plate 52, lower portion.]

A. aurea. Ex China allata . . . vivam vidi ex horto Regio Kew. Angliae cura Dni Aiton. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 419.]

A. lutea. (*Amaryllis lutea*, Syst. Nat.) [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 415.]

A. Belladonna. (Trew. Seligmann, t. 12.) Habitat in Africa Australi: Cap: Bona Spei. Obs: Cornutii figura videtur aliam exprimere plantam, sed quam ignoro; facies potius *Amaryllid: falcatae*. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 417.]

A. Reginae. (Trew. Seligmann. t. 18.) Habitat in America Meridionali. Vulgo Mexican-Lilly. Floret in Januarii vulgatissime in hortis Anglorum. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 416.]

A. vittata. (Ferr. Flor. 166, t. 119 ?) In fine mense Aprilis florentem vidi in selecto [?] Horto Dni Dris Pitcairn in Islington; in Caldario ubi per 14 dies fere floruit speciosissima planta. [Specific diagnosis, slightly corrected, printed in Aiton, Hort. Kew. 1, p. 418.]

A. undulata. (*Amaryllis undulata*, Hill. Hort. Kew. p. 352, t. 14.) Habitat in Africa Australi. Vulgaris in Hortis Anglorum. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 420.]

A. formosissima. (*Sprekelia Heisterii*, Trew. Seligmann, t. 24.) Habitat in America Meridionali. Rarissime biflora. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 416.]

A. sarniensis. (Trew. Seligmann. t. 30) Habitat in Japonia . . . in Africa Australi: Cap: B: spei. (Masson.) [Note on its introduction into Guernsey. Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 420.]

A. orientalis. (*Amaryllis orientalis*, Sp. Pl. 422.) Habitat in India. [Specific diagnosis printed in Aiton, Hort. Kew. 1, p. 420, but the last four words omitted.]

Eucomea regia. (*Fritillaria regia*, Syst. Nat.) Habitat in Africa Australi: Cap. b. spei.

E. clavata. (? *Fritillaria nana* Syst. Nat.; Mant. p. 223) Habitat in Africa Australi: Cap. b. spei.

E. undulata. (*Asphodelus comosus*, Houtt. Hist. Nat. XII, p. 336, t. 83; *Fritillaria longifolia*, Hill. Hort. Kew. p. 354, t. 15.) Habitat in Africa Australi: Cap. b. spei.

Lilium longiflorum. Habitat in Japonia. In collect: Burmanniana.

LIST OF ABBREVIATIONS USED IN THE CITATIONS.

- Aiton, Hort. Kew.** W. Aiton: Hortus Kewensis. London, 1789. 3 vols. 8vo; ed. 2, London, 1810-13. 5 vols. 8vo.
- Barr. icon.; Barrel.** J. Barrelier: Plantae per Galliam, Hispaniam et Italiam observata. Parisiis, 1714. 3 vols. fol.
- Catesb. Carol.** M. Catesby: The natural history of Carolina, Florida, and the Bahamas Islands. London, 1731, 1743. 2 vols. fol.
- Comm. hort.** J. & C. Commelin: Horti medici Amstelodamensis rariorum plantarum descriptio et icones, auctore Jo. Commelino. Amstelodami, 1697. Pars altera, auctore Casp. Commelino. 1701. fol.
- Comm. plant. rar.** C. Commelin: Plantae rariores et exoticae horti medici Amstelodamensis. Lugduni Batavorum, 1706. 4to.
- Dill. Elth.** J. J. Dillenius: Hortus Elthamensis. Londini, 1732. 2 vols. fol.
- du Bry Floril.** J. T. de Bry: Florilegium novum. [Oppenheim,] 1612(-14). fol.
- Ferr. Flor.** J. B. Ferrarius: Flora s. florum cultura. Romae, 1633; Amstelodami, 1646. 4to.
- Fl. Arag.** I. J. d'Asso y del Rio: Synopsis stirpium indigenarum Aragoniae. Massileae, 1779. 8vo.
- Forsk. desc. Plant. Arab.** P. Forskal: Flora Aegyptiaco-Arabica, sive descriptiones plantarum quas per Aegyptum inferiorem et Arabiam Felicem detexit Pet. Forskal. Havniae, 1775. 4to.
- Hill, Hort. Kew.** John Hill: Hortus Kewensis. . . Londini, 1768. 8vo.; ed. 2, 1769.
- Hort. Eyst.** B. Besler: Hortus Eystettensis. [Norimbergae,] 1613. fol. max.
- Houtt. Hist. Nat.** M. Houttuyn: Natuurlyke historie . . . Tweede Deel. Amsterdam, 1773-83. 14 vols. 8vo.
- Jacqu. amer.** N. J. Jacquin: Selectarum stirpium americanarum historia. Vindobonae, 1763. fol.
- Jacqu. hort.** N. J. Jacquin: Hortus botanicus Vindobonensis. Viennae, 1770-76. 3 vols. fol.
- Mant.** C. Linnaeus: Mantissa plantarum [prima]. Holmiae, 1767; . . . altera. Holmiae, 1771. 8vo.
- Merian. Surin.** M. S. Merian: De generatione et metamorphosis Insectorum Surinamensium. Hagae Comitum, 1726. fol.
- Park. Par(ad).** J. Parkinson: Paradisi in Sole Paradisus terrestris. London, 1629. fol.
- Plukn. Alm.** L. Plukenet: Almagestum botanicum. Londini, 1696. 4to.
- Plukn. phyt.** L. Plukenet: Phytographia. Londini, 1691-96.
- Raji Hist.** John Ray: Historia Plantarum. Londini, 1686-1704. 3 vols. fol.
- Rhed. Hort. Malab.** H. A. van Rheedee tot Draakestein: Hortus Indicus Malabarius. Amstelodami, 1678-1703. 12 vols. fol.
- Rob. icon.** [319 plates of plants engraved by Nic. Robert, A. Bosse et Lud. de Chastillon.] fol.
- Hudb. Elys.** Olof Rudbeck, father and son: Campi Eylsii liber secundus. Upsaliae, 1701. fol. [A very scarce book, on account of the fact that most of the copies of this volume, as well as those of Vol. 1, published in 1702, were destroyed in a great fire at Uppsala in 1702. The second volume had been published first as likely to be more attractive on account of its woodcut illustrations of garden plants. In 1789 Sir James E. Smith published 'Reliquiae Rudbeckianae,' using some of the surviving unpublished woodblocks, still in the Linnaean Collections, for illustrations.]
- Rumph. Amb.** G. E. Rumphius: Herbarium Amboinense. Partes VI et Auctarium. Amstelædami, 1750-55. fol.
- Salisbury, Prodr.** R. A. Salisbury: Prodr. stirpium in horto ad Chapel Allerton vigentium. Londini, 1796. 8vo.
- Seb. Thes.** Albertus Seba: Thesaurus rerum naturalium. Amstelædami, 1734-65. 4 vols. fol.
- Sp. Pl.** C. Linnaeus: Species plantarum. Holmiae, 1753. 2 vols. 8vo; ed. 2, Holmiae, 1762, 1763. 2 vols. 8vo.
- Suppl. (Plant.)** C. Linnaeus the younger: Supplementum plantarum. Brunswickae, 1781. 8vo
- Swert, Flor.** E. Sweert: Florilegium. Amstelodami, 1612-14; and later editions.
- Syst. Nat.** C. Linnaeus: Systema Naturae. Ed. 12. Holmiae, 1767-68. 3 vols. 8vo.
- Trew. Seligmann.** J. M. Seligmann: Hortus nitidissimus, sive amoenissimorum florum imagines, quas collegit Chr. Jac. Trew, in æs incisissimis vivisque coloribus pictas edidit Joh. Mich. Seligmann. Norimbergae, 1750-73.

EDITORIAL NOTE—Under date of August 26, 1937, Dr. Spencer Savage writes, from the headquarters of The Linnean Society of London, Burlington House, Piccadilly, London, W. 1,—“The title of the book from which the portrait of the younger Linnaeus was photographed is as follows: *Minne af von Linné, Fader och Son. Af Sv. Hedin, M.D. Stockholm, 1808. 8vo.* The book is really in two parts, with separate title pages, one part dealing with the elder Linnaeus and the other with the younger Linnaeus. There are two plates, a portrait of Linn. patr. at the beginning, and the Linn. fil. portrait at the beginning of the second part.”

A CHECKLIST OF THE BULBOUS AMARYLLIDACEAE OF MEXICO¹C. V. MORTON, *U. S. National Museum*

The following list is intended to include all species of bulbous Amaryllidaceae that have been reported as native to Mexico. A critical estimate of the group is hardly possible from the limited material now available, and consequently the present treatment is little more than a compilation of published data. It is likely that further study would result in a reduction of the number of species recognized in *Hymenocallis*. *Zephyranthes* is under critical study by Prof. H. H. Hume at the present time.

Tribe ALLIEAE

I. ALLIUM L.

1. ALLIUM CALIFORNICUM Rose, Contr. U. S. Nat. Herb. 1: 12. 1890.
RANGE: Northern Lower California.
2. ALLIUM DRUMMONDII Regel, Acta Hort. Petrop. 3, pt. 2: 112. 1875.
RANGE: Coahuila. United States.
3. ALLIUM EUROTOPHILUM Wiggins, Contr. Dudl. Herb. 1: 164. pl. 12, fig. 1. 1933.
RANGE: Northern Lower California.
4. ALLIUM GLANDULOSUM Link & Otto, Ic. Pl. Rar. Hort. Berol. 1: 33. pl. 17. 1841.
RANGE: Central and northern Mexico. Closely related to *Allium Kunthii*, but differing in its dark purple perianth segments and two-edged scapes, the margins of which are bordered with granular papillae.
5. ALLIUM HAEMATOCHITON Wats. Proc. Amer. Acad. 14: 227. 1879.
RANGE: Northern Lower California. California.
6. ALLIUM KUNTHII Don, Mem. Wern. Soc. 6: 82. 1827.
Schoenoprasum lineare HBK. Nov. Gen. et Sp. 1: 277. 1815. Not *Allium lineare* L. (1753).
Allium scaposum Benth. Pl. Hartw. 26. 1840.
RANGE: Almost throughout Mexico. Southwestern United States.
7. ALLIUM PENINSULARE Lemmon, Pittonia 1: 165. 1888.
RANGE: Northern Lower California. California.
8. ALLIUM PLUMMERAE Wats. Proc. Amer. Acad. 18: 195. 1883.
RANGE: Northern Mexico. Arizona.
9. ALLIUM PRAECOX Brandeg. Zoe 5: 228. 1906.
RANGE: Northern Lower California. California.
10. ALLIUM UNIFOLIUM Kell. Proc. Calif. Acad. 2: 112. pl. 35. 1863.
RANGE: Northern Lower California. California.

II. BEHRIA Greene

1. BEHRIA TENUIFLORA GREENE, Bull. Calif. Acad. 2: 143. 1886.
Bessera tenuiflora Macbr. Contr. Gray Herb. n. ser. 56: 11. 1918.
RANGE: Lower California.

III. BLOOMERIA Kell.

1. BLOOMERIA CROCEA (Torr.) Coville, Contr. U. S. Nat. Herb. 4: 203. 1893.
Allium croceum Torr. Bot. Mex. Bound. 218. 1859.
Bloomeria aurea Kell. Hesperian 3: 437. 1859.
RANGE: Northern Lower California. California.

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IV. BRODIAEA J. E. Sm.

1. BRODIAEA CAPITATA Benth. Pl. Hartw. 339. 1857.
RANGE: Northern Lower California. California.
2. BRODIAEA PALMERI Wats. Proc. Amer. Acad. 24: 78. 1889.
Triteleia Palmeri Greene, Pittonia 1: 292. 1889.
RANGE: Lower California.

V. MILLA Cav.

1. MILLA BIFLORA Cav. Icon. Pl. 2: 76. pl. 196. 1793.
Askolame biflora Raf. Fl. Tell. 2: 11. 1837.
? *Diphalangium graminifolium* Schauer, Linnaea 19: 703. 1847.
RANGE: Central and northern Mexico. Southwestern United States.

VI. MUILLA Wats.

1. MUILLA PURPUSII Brandeg. Univ. Calif. Publ. Bot. 4: 177. 1911.
Bloomeria Purpusii Macbr. Contr. Gray Herb. n. ser. 56: 9. 1918.
RANGE: Central Mexico. An insufficiently known species.
2. MUILLA SEROTINA Greene, Erythea 1: 152. 1893.
RANGE: Northern Lower California. California.

VII. NOTHOSCORDUM Kunth

NOTE: The name *Geboscon* Raf. (1824), taken up for this genus by House, is a *nomen nudum*. *Geboscon* Raf. (Fl. Tell. 2: 19. 1837) is different and is a synonym of *Allium*. *Pseudoscordum* Herb. (1837) is a *nomen nudum*. *Periloba* Raf. (1838), cited as a synonym at the time of the conservation of *Nothoscordum* by the International Congress at Brussels, is not of this family, but belongs to the Nolanaceae, even though as recently as 1930 Krause has given it as a synonym of *Nothoscordum*. The first validly published name is therefore *Nothoscordum* Kunth (1843), and it is here suggested that this be removed from the list of *nomina conservanda*.

1. NOTHOSCORDUM BIVALVE (L.) Britt. in Britt. & Brown, Ill. Fl. N. U. S. 1: 415. 1896.
Ornithogalum bivalve L. Sp. Pl. 306. 1753.
Allium striatum Jacq. Coll. Suppl. 51. 1796.
? *Schoenoprasum longifolium* HBK. Nov. Gen. & Sp. 1: 277. 1815.
? *Allium longifolium* Spreng. Syst. 2: 38. 1825.
? *Praskoinon longifolium* Raf. Fl. Tell. 4: 29. 1838.
RANGE: Mexico and Guatemala. Eastern and southern United States.
2. **Nothoscordum inodorum** (Ait.) Morton, comb. nov.
Allium inodorum Ait. Hort. Kew. 1: 427. 1789.
Allium gracile Ait. op. cit. 429.
Allium fragrans Vent. Hort. Cels. pl. 26. 1800.
Maligia gracilis Raf. Fl. Tell. 2: 19. 1837.
Nothoscordum fragrans Kunth, Enum. 4: 461. 1843.
RANGE: Mexico to Costa Rica. Jamaica. Southern United States.

VIII. PHARIUM Herb.

1. PHARIUM ELEGANS (Schult.) Steud. Nom. ed. 2, 2: 316. 1841.
Bessera elegans Schult. f. Linnaea 4: 121. 1829.
Pharium fistulosm Herb. Bot. Reg. 18: pl. 1546. 1832.
Pharium Herberti Steud. Nom. ed. 2, 2: 316. 1841.
Bessera multiflora Mart. & Gal. Bull. Acad. Brux. 9²: 385. 1842.
Bessera miniata Lem. Fl. des Serres 4: pl. 424. 1848.
Bessera fistulosa Lindl. ex Pritz. Icon. Ind. 149. 1855.
Bessera Herberti G. Don ex Sweet, Hort. Brit. ed. 3, 694. 1839.

RANGE: Central and northern Mexico.

NOTE: The name *Bessera*² has been proposed for conservation, but such a course appears highly undesirable. There is only a single valid species, which is neither widely known nor of any economic importance. Furthermore, there is a valid name available (*Pharium*), so that no new name or combination is necessary. The genus *Bebria*, considered a synonym by Macbride, appears sufficiently distinct. *Androstephium*, also, has been considered a synonym, but that seems more closely related to *Brodiaea* than to *Bessera*.

Tribe CRINEAE

IX. CHLIDANTHUS Herb.

1. CHLIDANTHUS EHRENBURGII (Klotzsch) Kunth, Enum. 5: 654. 1850.
Coleophyllum Ehrenbergii Klotzsch in Otto & Dietr. Allg. Gart. Zeit. 8: 185. 1840.
RANGE: Described from Mexico.

NOTE: A wholly dubious plant. Nothing resembling it has since been found.

X. CRINUM L.

1. CRINUM AMERICANUM L. Sp. Pl. 292. 1753.

NOTE: Recorded from Veracruz by Kunth and from San Blas by Hemsley. The reports are perhaps erroneous.

2. CRINUM ERUBESCENS Sol. in Ait. Hort. Kew. 1: 413. 1789.
Crinum cruentum Ker. Bot. Reg. 2: pl. 171. 1816.
Crinum Loddigesianum Herb. Amaryll. 253. 1837.
Crinum erubescens var. *mexicanum* M. J. Roem. Syn. 4: 79. 1847.
Crinum cruentum var. *albidum* Kunth, Enum. 5: 555. 1850.

RANGE: Jalisco, Nayarit, Puebla and Oaxaca. Guatemala, Honduras and Nicaragua. Naturalized or cultivated in El Salvador and Costa Rica.

NOTE: Baker (Handbook of Amaryllidaceae) placed *C. erubescens* in the sub-genus *Platyaster*, characterized by lanceolate perianth segments. On the other hand *Crinum cruentum* is put into *Stenaster*, which includes those species with linear segments. The original plate of *C. cruentum* shows the segments to be lanceolate, exactly as in *C. erubescens*, and even Dean Herbert, whose specific concept was extremely narrow and who moreover had first-hand acquaintance with living plants of both species, was unable to find any difference between them, except that *C. cruentum* had more erect leaves of a darker green color and somewhat darker-colored flowers. I therefore have no hesitancy in reducing *C. cruentum* to synonymy. There does, however, actually exist a plant having truly linear perianth segments. This is from the Nicoya Peninsula, Costa Rica. It has been identified as *C. cruentum*, but doubtless represents an undescribed species.

The only other native *Crinum* of continental North America is *C. Kunthianum* M. J. Roem., which has been found on Barro Colorado Island, Panama Canal Zone.

Tribe ZEPHYRANTHEAE

XI. COOPERIA Herb.

1. COOPERIA DRUMMONDII Herb. Bot. Reg. 22: pl. 1835. 1836.
Cooperia mexicana Herb. Amaryll. 182. 1837.

RANGE: Tamaulipas, Nuevo Leon, San Luis Potosi, and Oaxaca. United States.

² *Bessera* Schult. f. Linnaea 4: 121. 1829. Not Schult. (1809).

2. COOPERIA MIRADORENSIS Kränzl. Repert. Sp. Nov. Fedde 21: 75. 1925.
RANGE: Mirador, Veracruz.
3. COOPERIA PEDUNCULATA Herb. Amaryll. 179. pl. 42, fig. 3-5. 1837.
RANGE: Coahuila, Tamaulipas, and Nuevo Leon. Texas.

XII. ZEPHYRANTHES Herb.

1. ZEPHYRANTHES ARENICOLA T. S. Brandeg. Proc. Calif. Acad. II. 2: 205. 1889.
RANGE: Mexico.
2. ZEPHYRANTHES CITRINA Baker, Bot. Mag. 108: pl. 6605. 1882.
RANGE: Yucatan.
3. ZEPHYRANTHES CONCOLOR (Lindl.) Benth. & Hook. Gen. Plant. 3: 724. 1883, in note.
Habranthus concolor Lindl. Proc. Hort. Soc. Lond. 1838: 8. 1838.
Hippeastrum concolor Baker, Journ. Bot. 16: 82. 1878.
RANGE: Mexican plateau.
4. ZEPHYRANTHES CONZATTII Greenm. Proc. Amer. Acad. 33: 473. 1898.
RANGE: Described from Oaxaca.
5. ZEPHYRANTHES ERUBESCENS Wats. Proc. Amer. Acad. 25: 162. 1890.
RANGE: Not known definitely.
6. ZEPHYRANTHES GRANDIFLORA Lindl. Bot. Reg. 11: pl. 902. 1825.
Zephyranthes carinata Herb. Bot. Mag. 52: pl. 2594. 1825.
Amaryllis carinata Spreng. Syst. 4, pt. 2: 152. 1827.
Amaryllis Lindleyana Schult. Syst. 7, pt. 2: 802. 1830.
Pogonema carinata Raf. Fl. Tell. 4: 10. 1838.
Atamosco carinata Wils. Sci. Surv. Porto Rico 5: 159. 1924.
RANGE: Mexican plateau.

NOTE: *Zephyranthes grandiflora* Lindl. was based on a mixture, the leaves and fruits described belonging to *Z. Lindleyana* Herb. The name *grandiflora* must naturally go with the floral element figured, which is *Amaryllis Lindleyana* Schult. and is the same as *Z. carinata*, under which name it has usually been known.

7. ZEPHYRANTHES LILACINA Liebm. Ind. Sem. Hort. Haun. 1844: 7. 1844.
RANGE: Mexico.
8. ZEPHYRANTHES LINDLEYANA Herb. Amaryll. 174. pl. 35, fig. 5. 1837.
Atamosco Lindleyana Standl. in Standl. & Cald. Lista Prelim. Pl. El Salv. 31. 1925.
RANGE: Mexico.
9. ZEPHYRANTHES LONGIFOLIA Hemsl. Diagn. Pl. Nov. 3: 55. 1880.
Atamosco longifolia Cockerell, Canad. Ent. 33: 283. 1901.
RANGE: Northern Mexico. Southwestern United States.
10. ZEPHYRANTHES MACROSIPHON Baker, Gard. Chr. III. 16, pt. 2: 70. 1881.
RANGE: Mexico.
11. ZEPHYRANTHES NELSONI Greenm. Proc. Amer. Acad. 33: 473. 1898.
RANGE: Oaxaca and Chiapas.
12. ZEPHYRANTHES NERVOSA (HBK.) Herb. Amaryll. 172. 1837.
Amaryllis nervosa HBK. Nov. Gen. et Sp. 1: 278. 1815.
RANGE: Tropical Mexico. Venezuela. West Indies.

NOTE: This species has been considered the same as *Z. tubispatha* (L'Her.) Herb., of Argentina.

13. ZEPHYRANTHES VERECUNDA Herb. Bot. Mag. 52: pl. 2583. 1825.
? *Amaryllis minuta* HBK. Nov. Gen. et Sp. 1: 278. 1815.
Zephyranthes striata Herb. Bot. Mag. 52: pl. 2593. 1825.
Amaryllis verecunda Schult. Syst. 7, pt. 2: 800. 1830.
Amaryllis striatula Schult. op. cit. 801.
Zephyranthes sessilis Herb. Amaryll. 175. 1837.
Zephyranthes sessilis var. *verecunda* Herb. loc. cit.
Zephyranthes sessilis var. *verecunda* Herb. loc. cit.
Zephyranthes Grahamiana Herb. loc. cit.
RANGE: Mexico and Guatemala.



Wyndham Hayward

See page 127

Lycoris radiata

Plate 56



Wyndham Hayward

See page 142

Pure white Hybrid Amaryllis, Mary Davis

NOTE: The oldest name is very likely *Amaryllis minuta* H. B. K., but a proper combination under *Zephyranthes* has never been published. An additional synonym is probably *Amaryllis pallida* Willd. ex Schult. Syst. 7, pt. 2: 801. 1830 in synonymy = *Zephyranthes pallida* M. J. Roem. Syn. 4: 124. 1847.

Tribe EUCHARIDEAE

XIII. HYMENOCALLIS

1. HYMENOCALLIS BISTUBATA Herb. Bot. Reg. 30: Misc. 43. 1844.
RANGE: Not known.
2. HYMENOCALLIS CHORETIS Hemsl. Biol. Centr. Amer. Bot. 3: 335. 1882.
Choretis glauca Herb. Amaryll. 220. pl. 35, fig. 1. 1837.
Hymenocallis glauca Baker ex Benth. & Hook. Gen. Plant. 3: 734. 1883, in note. Not M. J. Roem. (1847).
RANGE: Not known.
3. HYMENOCALLIS CONCINNA Baker, Gard. Chr. III. 14, pt. 2: 150. 1893.
RANGE: Not known.
4. HYMENOCALLIS CORDIFOLIA Micheli, Rev. Hort. 71: 444. 1899.
RANGE: Guerrero.

NOTE: From the description and figure this must be one of the most distinct species of the genus.

5. HYMENOCALLIS EUCHARIDIFOLIA Baker, Gard. Chr. 1884, pt. 1: 700. 1884.
RANGE: Sinaloa and Nayarit.

NOTE: Described from material of uncertain origin. The Mexican specimens which I have tentatively so identified are fragmentary but agree with the description.

6. HYMENOCALLIS GALVESTONENSIS (Herb.) Baker, Handb. Amaryll. 126. 1888.
Choretis galvestonensis Herb. Amaryll. 219. fig. 35. 1837.
Hymenocallis jaliscensis M. E. Jones, Extr. from Contr. West. Bot. 18: 33. 1933.
RANGE: Jalisco, Colima, Nayarit, and Sinaloa. Texas.
7. HYMENOCALLIS GLAUCA (Zucc.) M. J. Roem. Syn. 4: 173. 1847.
Pancratium glaucum Zucc. Abh. Baier. Akad. Wiss. 2: 317. 1837.
RANGE: Oaxaca and Guerrero.
8. HYMENOCALLIS GRAMINIFOLIA Greenm. Proc. Amer. Acad. 39: 74. 1903.
RANGE: Morelos.
9. HYMENOCALLIS HARRISIANA Herb. Bot. Reg. 26: Misc. 35. 1840.
RANGE: Morelos and Nayarit.
10. HYMENOCALLIS HORSMANNI Baker, Handb. Amaryll. 125. 1888.
RANGE: Nayarit.
11. HYMENOCALLIS LITTORALIS (Jacq.) Salisb. Trans. Hort. Soc. London 1: 338. 1812.
Pancratium littorale Jacq. Sel. Amer. 99. pl. 179, fig. 94. 1763.
Pancratium americanum Mill. Gard. Dict. ed. 8, No. 7. 1768.
Pancratium Dryandri Ker, Quart. Journ. Sci. 3: 326. 1817.
Pancratium distichum Sims, Bot. Mag. 44: pl. 1879. 1817.
Hymenocallis littoralis var. *longituba* Herb. Bot. Mag. 53: under pl. 2621. 1826.
Hymenocallis littoralis var. *Dryandri* Herb. loc. cit.
Hymenocallis littoralis var. *disticha* Herb. loc. cit.
Hymenocallis littoralis var. *acutifolia* Herb. op. cit. pl. 2621.
Hymenocallis acutifolia M. J. Roem. Syn. 4: 174. 1847.
Hymenocallis americana M. J. Roem. op. cit. 176.
Hymenocallis arenaria M. J. Roem. loc. cit.
Hymenocallis Dryandri M. J. Roem. op. cit. 175.
Hymenocallis Staplesiana M. J. Roem. loc. cit.
RANGE: Yucatan Peninsula. Throughout Central America.

NOTE: Standley (Flora of Yucatan) takes up for this species the name *H. americana* (Jacq.) Salisb., a usage which I do not understand.

12. HYMENOCALLIS LONGIBRACTEATA Hochr. Bull. N. Y. Bot. Gard. 6: 265. 1910.
RANGE: Veracruz.
13. HYMENOCALLIS PRINGLEI Greenm. Proc. Amer. Acad. 39: 74. 1903.
RANGE: Hidalgo.
14. HYMENOCALLIS REPANDA Otto & Dietr. Allg. Gart. Zeit. 11: 123. 1843.
RANGE: Sinaloa and Nayarit (?).
15. HYMENOCALLIS RIPARIA Greenm. Proc. Amer. Acad. 41: 235. 1905.
RANGE: Morelos and Michoacan.

DOUBTFUL AND EXCLUDED SPECIES

16. HYMENOCALLIS MEXICANA (L.) Herb. Bot. Reg. Append. 44. 1821.
Pancratium mexicanum L. Sp. Pl. 290. 1753.
RANGE: Southern United States. Ascribed to Mexico in error, presumably.
17. PANCRACTIUM TRICHROMUM Cerv. in La Llave & Lex. Nov. Veg. Desc. 1: 20. 1824.

NOTE: The description indicates a most unusual plant, perhaps not belonging to *Hymenocallis*.

Tribe HIPPEASTREAE

XIV. SPREKELIA Heist.

1. SPREKELIA FORMOSISSIMA (L.) Herb. Bot. Reg. Append. 35. 1821.
Amaryllis formosissima L. Sp. Pl. 293. 1753.
Amaryllis Karwinskii Zucc. in Otto & Dietr. Allg. Gart. Zeit. 2: 245. 1834.
Sprekelia glauca Lindl. Bot. Reg. 26: Misc. 65. 1840.
Sprekelia ringens Morr. Ann. Soc. Hort. Gand. 2: 133. pl. 60. 1846.
Sprekelia Karwinskii M. J. Roem. Syn. 4: 293. 1847.
RANGE: Chihuahua, Durango, Mexico, Jalisco, Michoacan, and Guerrero.

ADDITIONAL AMARYLLIDACEAE OF PERU

J. FRANCIS MACBRIDE

Field Museum, Chicago, Ill.

BOMAREA

(All the determinations in this group were made by Mr. E. P. Killip, U. S. National Museum, who wrote the treatment of the genus for the Flora of Peru).

Bomarea involucrosa (Herb.) Baker. Departments of Lima, Junin, Cuzco, and Puno. Vernacular name Sulla-sulla.

Bomarea campanuliflora Killip. Quebrada de Toipata, Department of Puno.

Bomarea bracteata (R. & P.) Herb. Departments of Ancash and Junin.

Bomarea puberula (Herb.) Kraenzl. Andinamarca and Huánuco.

Bomarea Fiebrigiana Kraenzl. Santa Ana Valley, Cuzco. Also in Bolivia.

Bomarea porrecta Killip. Known only from Peru, the exact locality unknown.

Bomarea zosteræfolia Killip. Department of Ancash.

Bomarea dulcis (Hook.) Beauverd. Departments of Cajamarca, Ancash, Lima, Junin, Puno, Arequipa, Moquehua, and Cuzco.

Bomarea petraea Kraenzl. Puno. Also in Bolivia.

Bomarea uniflora (Mathews) Killip. Ancash and perhaps elsewhere. Also in Bolivia.

Bomarea phyllostachya Mast. Huánuco and perhaps elsewhere.

Bomarea crocea (R. & P.) Herb. Lima, Junin, and Cuzco. Called "Chocllopa."

Bomarea pumila Griseb. Cuzco, at 3000 meters. The smallest plant of the genus, the stems only 4-5 cm. long.

Bomarea secundiflora (R. & P.) Baker. Cajamarca and Huánuco.

Bomarea nervosa (Herb.) Baker. Department of Amazonas.

Bomarea cruenta Kraenzl. Department of Amazonas.

Bomarea coccinea (R. & P.) Baker. Huánuco and Junin.

Bomarea brevis (Herb.) Baker. Huánuco, Junin, and Cuzco. Also in Bolivia.

Bomarea distichophylla (R. & P.) Baker. Huánuco, Junin, and Cuzco.

Bomarea cornigera Herb. Probably from northern Peru.

Bomarea torta (HBK.) Herb. Cajamarca and Amazonas.

Bomarea Stuebelii Pax. Amazonas and Junin.

Bomarea Klugii Killip. Near Moyobamba, San Martin.

Bomarea rosea (R. & P.) Herb. Ancash, Huánuco, and Junin.

Bomarea anceps R. & P. Department of Junin.

Bomarea aurantiaca Herb. Departments of Ayacucho, and Cuzco, and perhaps elsewhere.

Bomarea filicaulis Kraenzl. Monzon, Huánuco.

Bomarea sclerophylla Kraenzl. Department of Huánuco.

Bomarea macranthera Kraenzl. Huacapistana, Junin.

Bomarea cernua Griseb. Huánuco and Cuzco.

Bomarea purpurea (R. & P.) Herb. Amazonas and Huánuco. Also in Colombia and Ecuador.

Bomarea setacea (R. & P.) Herb. Cajamarca, Huánuco, Junin, Cuzco, and Sandia. Also in Ecuador.

Bomarea densiflora Herb. Amazonas and perhaps elsewhere. Also in Ecuador.

Bomarea denticulata (R. & P.) Herb. Huánuco and perhaps elsewhere.

Bomarea caudata Killip. Choimacota Valley, Ayacucho.

Bomarea crinita Herb. Amazonas and perhaps elsewhere.

Bomarea loreti Kraenzl. Cerro de Ponasa, Loreto.

Bomarea formosissima (R. & P.) Herb. Huánuco and Ayacucho.

Bomarea superba Herb. Described from Peru, the exact locality unknown.

Bomarea sanguinea Kraenzl. Huánuco and Cuzco. Also in Bolivia. Local names Pachanca and Sullo-sullo.

Bomarea nematocaulon Killip. Playapampa, Huánuco, at 2800 meters.

Bomarea angustissima Killip. Tambo de Vaca, Huánuco, at 4000 meters.

Bomarea Engleriana Kraenzl. Monzon, Huánuco, at 3500-3700 meters.

Bomarea praeusta Kraenzl. Arequipa and probably elsewhere.

Bomarea parvifolia Baker. Type from Huantanga.

Bomarea campylophylla Killip. Type from Vilcabamba, Huánuco.

Bomarea cornuta Herb. Huánuco and perhaps elsewhere.

Bomarea ayavacensis Kraenzl. Above Ayavaca, Piura, at 2900 meters.

Bomarea tarmensis Kraenzl. Huánuco and Ayacucho.

Bomarea ovata (Cav.) Mirb. Cajamarca, Ancash, Huánuco, Lima, Junin, Moquehua, and Cuzco. Also in Bolivia but, as here restricted, unknown farther north. Local name, Ulubaya. The sweet tubers are eaten.

Bomarea cordifolia (R. & P.) Herb. Posuso, Department of Huánuco.

Bomarea latifolia (R. & P.) Herb. Antiquipa, Arequipa.

Bomarea Hookeriana Herb. Amazonas and Junin.

Bomarea dolichocarpa Killip. Huánuco, San Martin, Loreto, and Junin.

Bomarea speciosa Killip. Huánuco.

Bomarea lyncina Herb. Junin and perhaps elsewhere.

Bomarea declinata (Poepp. & Endl.) Klotzsch. San Martin and Junin, and possibly elsewhere.

(N. B. The species are listed here in the order in which they are treated in the Flora of Peru).

ALSTROEMERIA

Alstroemeria chorillensis Herb. Department of Lima.

Alstroemeria Ligta L. Lima.

Alstroemeria peleggrina L. Ancash, Lima, and Huánuco. Called Peregrina and Azucenda de Lima.

Alstroemeria pygmaea Herb. Junin. Also in Bolivia and Patagonia.

Alstroemeria recumbens Herb. Lima.

Alstroemeria violacea Phillippi. Arequipa. Also in Chile.

HYPOXIS

Hypoxis decumbens L. San Martin and Huánuco. A species of wide distribution.

DISTREPTA

Distrepta vaginata Miers. Lima. Also in Chile.

AUSTRALIAN AMARYLLIDACEAE¹

G. K. COWLISHAW, F. R. H. S.
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This world wide Order is found most abundantly in the warm and temperate regions of the world, and particularly in those parts where the climate is characterized by decided wet and dry seasons. Such conditions exist in most parts of Australia, and it is therefore remarkable that but thirteen genera of this order have been recorded from this island continent. Nine are endemic, and of these, six are confined to Western Australia. Since the climatic conditions of so much of Australia are so suitable for the growth of exotic species which respond so well to cultivation here, one is led to wonder why a far larger number of such genera and species have not been found. Possibly the explanation lies in the fact that the *Amaryllideae* are but a recent link in evolutions chain. The Australian Flora and Fauna are on the whole, a survival of the past—living fossils they are often called—or have evolved from primitive forms, which have disappeared without leaving living survivors elsewhere in the world. We are therefore not surprised to find that it is only the older forms of the *Amaryllideae* or such species that owing to the nature of their seeds could have been transported to these shores by wind and waves of the sea, which are found in Australia. In the older genera of *Amaryllideae* we have something different and exclusively Australian. This is a subject I would like to go into at some length, but it hardly comes within the scope of the present paper.

Australian botanists have grouped the five tribes *Hæmodoreae* (2 genera), *Conostyleae* (5 genera), *Hypoxideae* (2 genera), *Agaveae* (1 genera) and *Euamaryllideae* (3 genera), (often ranked as separate orders) together to form the *Amaryllideae*. Thus they obtain a well defined group such as we possess in the *Irideae*, and the *Orchideae*, without leaving any misfits.

Each of these groups or tribes, comprising the *Amaryllideae* so constituted, have definite characteristics, which separate them individually, but collectively they agree in having important characteristics in common, such as are sufficient to clearly separate them from other Orders. It is not my intention to consider in detail the characteristics above referred to, nor to those of the individual tribes, or divisions comprising the *Amaryllideae*, other than the *Euamaryllideae*. I would refer the reader to Bentham's "Flora Australiense", should he or she desire any further information. With the exception of Western Australia, well written "Floras" of the different states have been written from time to time since Bentham's monumental work appeared, nearly sixty years ago. These may be consulted with advantage. In particular I would refer those interested in the *Amaryllideae* to Bailey's "Queensland Flora" in which much information on the *Crinums*, etc., may be obtained, and moreover many excellent illustrations of these plants may be studied.

¹ Mr. Cowlishaw follows the classification of Bentham's "Flora Australiense."

KEY TO THE AUSTRALIAN EUAMARYLLIDAE

Perianth glabrous, stigmas small; bulbous plants; leaves horizontally flat, channeled or terate; flowers umbellate or rarely solitary on leaflets scapes.

No Corona; flowers large; ovules several in 2 rows in each cell -----1. *Genus Crinum*.

Filaments connected below the middle by a corona; ovary 3-celled with 2 ovules in each cell; leaves broad with distinct veins -----2. *Genus Eurycles*.

Ovary 1-celled with 2 ovules; leaves narrow with close veins, or broad with distinct primary veins -----3. *Genus Calostemma*.

Many of the Australian *Amaryllideae* are inconspicuous plants, possessing no qualities whatsoever to recommend them to the horticulturalist. On the other hand we have many species, particularly among the *Crinums* and similar genera, which stand well among the first rank as garden subjects.

Of the thirteen genera which have been recorded from Australia, but three, *Crinum*, *Calostemma*, and *Eurycles*, possess bulbs; of the remainder *Haemodorum*, *Tribonathes*, *Curculigo* and *Hypoxis* possess rhizomes or tuberous rootstocks. The rest are fibrous rooted plants. No bulbous rooted *Amaryllideae* has been recorded from the West for they are confined to the Eastern portion of the continent, and are found within several hundreds of miles of the coast. One species of *Crinum* has followed the Murray-Murrumbidgee-Darling River System almost to its mouth—*C. flaccidum*. The bulbous rooted species are found growing in the districts of heavy rainfall periods or in close proximity to water. This does not mean that they do not grow in districts of long dry spells, but where the rainfall is most abundant in the wet season. They are often found growing in close proximity to rivers where they receive moisture at the roots during the year round. In comparison with the size of the plant, Australian *Crinums* make but small bulbs, and are often evergreen.

I. CRINUM

From a horticultural point of view, the crinums are about the most important of all the Australian *Amaryllideae*. These plants are bulbous herbs, with long flat radical leaves, sometimes channeled; scape simple, leafless; flowers large, and in the Australian species, mostly white, in a terminal umbel surrounded by a few membranous slightly coloured bracts.

There are 10 species recorded from Australia, all of which are found in Queensland, two extending to N. S. W. and Victoria.

The genus falls naturally into two divisions, in the first of which the stems are perennial above ground, and includes two species. *C. pedunculatum* and *C. Douglasii*. The former has a very wide range, and possesses many regional varieties. It is apparently closely related to *C.*

asiaticum, and is the commonest of Australian crinums in cultivation. It forms a stately plant carrying its long broad leaves on a more or less extended column. The flowers are white, with narrow segments, and may number as many as 40 in an umbel. The seeds are large, and retain their power of germination for many months. It is found growing from North Queensland down the eastern coast to Victoria.

The other group possess no perennial stems above the ground. The best known of these is *C. flaccidum* which possesses white flowers, and forms large bulbs some considerable distance below the ground. This species has followed the Murray-Murrumbidgee-Darling River System to its mouth in South Australia and is found in all the Eastern States except Tasmania. It is confined to the inland regions and is seldom noted close to the sea coast.

GENUS CRINUM, 10 Australian species, 9 endemic.

1. *C. pedunculatum*, Eastern States; Fiji, New Caledonia, New Guinea, Lord Howe's Is.
2. *C. Douglasii*, Queensland
3. *C. venosum*, Queensland
4. *C. brachyandrum*, Queensland
5. *C. brevistylum*, Queensland
6. *C. uniflorum*, Queensland
7. *C. angustifolium*, Queensland
8. *C. pestilentis*, Queensland
9. *C. Brisbaneicum*, Queensland
10. *C. flaccidum*, Eastern inland.

Australian crinums are for the most part found growing along the banks of rivers in tropical scrubs or swamps, where they can enjoy the maximum amount of moisture at certain periods of the year. All take kindly to garden conditions, and respond well to cultivation. Seeds are easily germinated and in most species seedlings reach flowering stage by the end of the fourth year.

II. EURYCLES

Next in importance from a horticultural point of view and more typically Australia is the Genus *Eurycles*. There are 2 species native in Australia, one of which is endemic, and the other extends to the Archipelago. These plants possess radical petiolate leaves; the lamina are broad with longitudinal rather distinct veins, and transverse veinlets between them; the scape is leafless, and flowers are usually white, in a terminal umbel surrounded by 2 or 3 membranaceous bracts.

These plants are bulbous, and the fruit is succulent as in the crinums. The larger of the two species which also extends its range beyond Australia, is *E. sylvestris* and is found in North Queensland. The other, *E. Cunninghami*, is found from Northern N. S. W. to Rockhampton, Queensland.

The latter species is often found growing in gardens about Sydney. It appreciates an abundance of water while growing. Seedlings will flower within 3 years. Both species have a decided resting period in the winter.

GENUS EURYCLES, 2 Australian species, 1 endemic

1. *E. sylvestris*, N. Queensland, Malay Peninsula and Philippine Is.
2. *E. Cunninghami*, North N. S. W. to Queensland.

III. CALOSTEMMA

Closely related to the Genus *Eurycles* is the Genus *Calostemma*. These plants possess variously coloured flowers, smaller than in *Eurycles*. The leaves are all radical, narrow, with close parallel veins, or broad with more distinct veins, and traverse veinlets. The outstanding characteristic of the Genus is the reduction of the ovary to a single cell. This appears to be due to the early abortion of two of the carpels.

Two species are fairly common, one in the north and the other in the south of Queensland. The latter extends to Northern N. S. W. and can be easily distinguished from the former by leaf characters. The first with yellow flowers possesses linear narrow leaves, and is known as *C. luteum*, and the other which has ovate leaves and white flowers is known as *C. album*. A third species with purplish pink flowers occurs and is known as *C. purpurea*.

The Calostemmas have been grown rather extensively in Southern Gardens for many years, though not nearly so commonly now as in former times. A number of hybrids were reputed to exist in the past but I have been unable to trace any of these. There is no doubt that they will cross with *Eurycles*, and it is possible that *C. album* is itself a natural hybrid.

The seeds are large, solitary and fleshy. They germinate freely, and seedlings flower in their third year.

GENUS CALOSTEMMA, 3 species endemic to Australia.

1. *C. purpureum*, S. Australia and N. S. W.
2. *C. luteum*, Queensland and N. S. W.
3. *C. album*, Gulf of Carpentaria.



Wyndham Hayward

See page 142

Hybrid Amaryllis, Ernestine

Plate 58



Wyndham Hayward

See page 142

Hybrid Amaryllis, Ethel Duckworth

THE GENUS ZEPHYRANTHES IN TEXAS¹

H. B. PARKS and V. L. CORY

Texas Agricultural Experiment Station

Imagine yourself one morning in mid-August standing at the edge of a landscape composed principally of a flat and almost barren terrain dotted sparingly with old crippled post oaks, the veterans of a two century war with Gulf storms. The foliage of these survivors of the war with weather and man seem torn and dry and so they are. You are looking at a bit of central south Texas in 1918. A three years' drought of great severity has practically eliminated grass and herbs. Shrubs and trees are nearing the limits of endurance. Wild animals and birds have moved and man giving up hope for rain is on the march toward water.

It is the afternoon of the same day. Welcome clouds come from nowhere and the almost forgotten rain begins, first gently, then in torrents and, as if to make up for lost time, keeps up the deluge for a night and a day. The long drought of 1914-1918 is no more. Two days later you stand in the same place and what a change, the much dejected oaks have assumed an air of arrogance in bright green leaves, still fresh from the wash. But, Oh the miracle! Where four days ago was only barren sand now hundreds of golden rain lilies rejoice in the return of rain. If you could have been with me on the two days pictured, you, too, would be a zephyranthes fan. About five years ago Mr. V. L. Cory, Range Botanist of the Texas Agricultural Experiment Station, made a remark as to his long interest in this genus. This paper is a popular account of our joint investigations.

To those who know the genus from one or two species growing in gardens where shade and moisture are plentiful and the plants bloom abundantly for a goodly length of time, it is necessary to recount the habits of this genus in a semi-arid country as an explanation as to why after two centuries of botanical exploration new species are being found. The species are very selective in their choice of a habitat. In fact so much so that given the habitat one can predict with much surety the species.

Z. texana is found only in loose friable soils. Often a colony will be found in black tight land. Investigation will show that these plants are growing in a friable soil that fills an old depression in the black soil.

Z. pulchella is even more selective. It grows only in shallow lake-beds located on the Gulf Coast near salt water, which contain rain water occasionally.

Z. species (not identified) has a similar habit but inhabits lake-beds far inland.

Z. longifolia is restricted to the Trans-Pecos and the High Plains where it grows in large colonies in former depressions which are now filled with wind blown soil.

The foliage of zephyranthes is so grass-like and exists for so short a

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time that it is overlooked. As the blooming period is short and occurs during adverse weather conditions it is little wonder that few persons have seen this most wonderful display of bloom. After living for over twenty years in a land where these plants occur the writers are agreed that a species might exist in a thickly settled community, and yet be unknown to the residents.

Z. texana came under cultivation at the Apicultural Research Laboratory near San Antonio in 1926. That year there was an abundant bloom in late July and many of the flowers were doubles or triplets. Bulbs producing such flowers were dug and replanted. Strange to say while the bulbs are still alive and have bloomed every year since but few flowers were plenus. In the field, however, each year many abnormal flowers were seen. The following table shows the erratic behavior and at the same time the fixed habits of *Z. texana*, while blooming under conditions of intermittent rainfall. There were six periods of blooming, and the average period was 3.5 days duration.

FLOWERING DATA OF ZEPHYRANTHES TEXANA IN 1933 *

Period	Rainfall		Interval	Duration of Bloom		Length of Blooming Period
	Date	Amount		Start	End	
Second	May 4	.49	6	May 10	May 13	3
Third	May 26	2.75	7	June 2	June 6	4
Fourth	June 13	1.77	5	June 18	June 21	3
Fifth	July 30	7.05	6	Aug. 5	Aug. 10	5
Sixth	Aug. 16	1.54		No bloom		
Seventh	Aug. 31	1.06	4	Sept. 4	Sept. 7	3
Eighth	Sept. 17	.40		No bloom		
Ninth	Sept. 26	1.56	2	Sept. 28	Oct. 1	3
AVERAGE		2.44	5			3.5

* There were nine blooming periods in 1933.

During a meeting of the Texas Florists Association at San Antonio in 1932 a florist visited the Laboratory and saw *Z. texana* in bloom. He informed us that this was not *Z. texana* but *Z. citrina* and later sent bulbs which were indeed *Z. citrina*. A bulb dealer in the Eastern United States advertised a new rain lily with a red exterior. On growing here this plant proved to be *Z. texana*. His attention was called to this and he has since advertised just yellow rain lilies. He stated that he had selected the smaller bulbs from a lot of *Z. citrina* he purchased and was glad to know they were *Z. texana*.

About the same time there came to us several inquiries as to yellow rain lilies growing near the Spanish Missions in San Antonio and vicinity and asking for bulbs and specimens. The inquiries originated from a newspaper item stating that the Spanish Padres brought the bulbs to the Missions years ago and that the plants had gone wild. The only species found was *Z. texana* and it not even common.

Mr. Wyndham Hayward presented us with some bulbs of *Z. citrina* which were larger than those procured elsewhere, undoubtedly due to better growing conditions. These grown in the same plats with other *Z. citrina* showed a marked difference in shade of color and some in size.

The season of 1936 this species made the best showing. They bloomed at two periods about a month apart. Most bulbs produced two or more flowers at a time, a habit that is shared with *Z. candida*.

Z. pulchella and *Z. chrysantha* were only names to us until September 1936 when, on a long expedition covering the entire Gulf Coast, we happened on the right place and right weather conditions near Ingleside. Here in a number of small lake beds, containing water from a recent rain, were thousands of golden lilies. We had made every effort to find a yellow Rain Lily in the Corpus Christi country but without result and now we had stumbled upon them. While the authorities seem to agree that *Z. pulchella* and *Z. chrysantha* are the same, there is the record in many places of a zephyranthes growing in the sandy soils near Corpus Christi. Well, it may be there. It is something for which to look. Mr. Robert Runyon reports that he finds *Z. pulchella* only in these lake beds near the Gulf. The recorded localities are now, near Brownsville; sixteen miles southeast of Corpus Christi; and at Ingleside, eighteen miles northeast of Corpus Christi and all in lake beds.

Another Rain Lily, species unknown, occurs abundantly in lake beds of the central southern part of the state. Bulbs from there are now growing in our plats, which, when they flower, will reveal their identity.

Z. longifolia has been recorded from Trans-Pecos Texas for many years. Records speak of them as occurring sparingly in low places. On May 25, 1935 we camped at Odessa, Ector County, Texas. In a low lake bed like depression back of the camp were literally acres of *Z. longifolia* full grown and awaiting sunshine before the flowers opened. The day was cold and wet. We left without seeing an open flower. This species was seen in similar places for a hundred miles eastward but no open flowers. Many bulbs were brought home for propagation and from which to obtain herbarium specimens. Although put into the soil in June 1935, no open flowers have been obtained. The plants come to full bud at appropriate seasons and drop the bud before it opens. A nice plat still awaits the day of blooming.

Z. erubescens S. Wats. was an enigma. We finally obtained the original description from Prof. H. H. Hume and found that both Hayward and Hume were hunting for Pena Station the place where the species was supposed to have been found. It took very little writing to locate this place as the original railroad station at Hebbronville and the collector did not visit that section the year of the collection. Without a doubt this is a Mexican species.

Z. candida Herb. is common as an escape throughout Texas where soft moist soils occur. It was seen growing abundantly at Deweyville on the Sabine River; at High Island near Galveston; and at a point eighteen miles east of San Antonio.

The last story is the best. For years we have asked about Rain Lilies on all our trips. In the spring of 1936 a lady, a botanist of good standing, reported that purple Rain Lilies occurred in the sand hills of central Texas. She was instructed to get samples and she did. They were brought in by a C. C. C. boy. There was no doubt as to the genus but was this *Z. rosea*? How could it be so far back in the sand hills. A visit

was made to the Camp. The officer in charge was asked. Yes, he knew where there were red Rain Lilies and led the party to a beautiful bed of *Z. rosea* in bloom in a near-by farmer's yard, but this was not the same flower sent us from the sand hills. Returning to the C. C. C. headquarters the officer found the boy who obtained the first red flowers. He denied having secured them from the farmer's garden and drew a map showing the exact spot whence the flowers came. We went there, into a solitude of abandoned fields, weeds, and a few lonely live oaks. Beneath a huge oak as the boy had directed, we found where he had dug the two specimens. There were many plants but no bloom. We dug several and then moved a few feet so as not to hurt the stand. The first lick with the mattock hit rock. A little excavating and a tombstone marked 1869 was found lying face up under six inches of drifted sand. What a vision! Three quarters of a century ago the sorrowing relatives planted a rare imported bulb, a tribute to the memory of the departed. We undoubtedly had robbed a grave, but research must go on. Those bulbs will bloom this summer and we will know.

We still have a long list of rumors to investigate and some may lead to unknown species. When we began we found listed:

Atamosco-Habranthus-Zephyranthes
alba Hort.
Andersoni Herb. var. *texanus* Wright
aurea Watson
candida Lindl.
carinata Herb.
chrysantha G. & T.
citrina Baker
erubescens S. Wats.
longifolia Hemsl.
pulchella A. G. Smith
rosea Lindl.
texana Herb.
Treatiae S. Wats.

The present time we know the following occur growing wild:

Zephyranthes
candida Lindl.
longifolia Hemsl.
pulchella J. G. Smith
texana Herb.

Probably *Z. alba*, *Z. rosea*, *Z. carinata*, and others exist as escapes. It is also probable that there are three additional species in the list of suspects.

ADDITIONAL NOTES ON SOUTH AFRICAN
AMARYLLIDACEAE

R. A. DYER,

Botanist, Division of Plant Industry,¹ Pretoria

It was gratifying to learn through correspondence that my remarks on South African Amaryllidaceae in last year's number of *Herbertia* had been of interest to some readers, and I regret that, this year, I am unable to devote so much time to an article. This is partly explained by my nomination as botanist by the Union Government to join an expedition, during February and March, to the "Lonely Island," Tristan da Cunha. Incidentally there is no record of any amaryllid having been found wild on the island, nor does there appear to be any likelihood of such a record in the future.

A few days prior to leaving Pretoria for Simonstown, and thence on H. M. S. Carlisle to Tristan da Cunha, I had the opportunity of testing in the field a new camera which I intended using on the trip. It was during this trial in the vicinity of Pretoria that the accompanying photographs of *Crinum Forbesianum* Herb., and *Buphane disticha* Herb., were taken (Plate 53). *Crinum Forbesianum* is a species closely allied to the more widely known *C. longifolium* Thunb. It is distinguished from this mainly by the more open flowers with darker keeled segments and the shorter scape. Baker, in *Flora Capensis*, vol. 6, 199 (1896), points out that the leaves of *C. Forbesianum* are ciliated, whereas those of *C. longifolium* are scabrous on the margin. The former was figured in Curtis's Botanical Magazine t.6545 and the latter, in the same work, t.661. It was a piece of good fortune that the specimen photographed was in such perfect condition, for most of the others had already been considerably eaten by a swarm of black and yellow beetles, probably *Pachnoda sinuata* F. Owing to the damage done by this pest it was impossible to obtain seeds this season and it is hoped to increase our stock from a few large bulbs which were transplanted into the garden at the Division of Plant Industry, Pretoria. The colouring of the flowers in the veld was not constant, some being less crimson than others.

Buphane disticha Herb., was referred to in my notes last year. The photograph (Plate 53) illustrates very well the unique appearance of the opposite series of leaves and the comparatively large bulb which is mostly exposed above ground and at the same time is protected by a thick coating of the dry leaf-bases. Although the surrounding grass is burnt almost annually the bulbs are unharmed, not only unharmed, but apparently stimulated by the heat of the fire to flower in very early spring before the growth of the leaves. However, I am not in a position to say that there is a definite relationship between the firing of the grassveld and the flowering of the *Buphane disticha* bulbs.

In a letter to me early this year, your Editor mentioned the increasing interest in America in the cultivation of species of *Cyrtanthus*, and enquired what prospects there were of a comprehensive account of the

¹Dept. of Agriculture and Forestry, Union of South Africa.

genus being prepared for publication in the near future. It would require a great deal of careful study to arrive at a satisfactory classification of species. At the present time botanists in South Africa, when attempting to apply the correct names to plants received for identification, are seriously handicapped by the absence of literature and type specimens. One of my colleagues, Miss I. C. Verdoorn, recently had occasion to investigate the identity of a specimen of *Cyrtanthus* from the Transvaal. It involved the true identity of *C. Tuckii* Baker, *C. contractus* N. E. Br., *C. angustifolius* Ait., and other closely related species in this most difficult group.

C. Tuckii was described by J. G. Baker from specimens collected in the eastern Cape Province by P. MacOwan. According to the description the type had 2 leaves $\frac{1}{4}$ - $\frac{1}{3}$ ins. broad at the time of flowering. It appears from Miss Verdoorn's research (although I may not commit her positively at this stage) that this, somewhat imperfectly known species, is widely spread from its type locality into Natal and Transvaal. In the latter two regions, however, it is found in different forms which may prove worthy of varietal rank. As compared with the other species mentioned, which have spreading segments, *C. Tuckii* has smaller and somewhat connivent segments. The flowers are yellow at the base of the tube and shade into red towards the lobes. Those of the Transvaal form are unicoloured: the base of the tube is light red and the intensity of the colour increases toward the lobes. The leaves are narrow and are produced after or sometimes during the flowering period. The Natal form has a red tube and green lobes and leaves are apparently usually absent at the time of flowering.

The accompanying illustration of *C. contractus* (Plate 54) represents a group of plants collected in the vicinity of Pretoria during November 1935 and which flowered in October of the following year. It will be noted that one bulb produced a leaf at the same time as the inflorescence, which feature is apparently unusual in this species, also. On the other hand these facts indicate that, in classification, too much stress must not be placed on the presence or on the absence of leaves at the time of flowering, particularly if the plants are growing under abnormal conditions.

A coloured illustration of the Transvaal form of *C. Tuckii* has been prepared for publication in Flowering Plants of South Africa and, if it is not included in this year's volume, it should certainly appear during 1938. It is possible also that one or two new species of *Nerine* will be described in the same work within the near future.

PRETORIA,
May 12, 1937.

THE FLOWERING HABIT OF COOPERIA TRAUBII

AUSKER E. HUGHES, *Florida*

Cooperia Traubii Hayward, described for the first time in 1936 *Herbertia*, is one of the most interesting and decorative of amaryllids. Aside from the attractive flowers, the flowering habit of this species is worthy of consideration. The flowers of most of the amaryllids open slowly, so slowly in fact, that one never notices the movements of the segments as they spread apart. In the case of *Cooperia Traubii*, however, the segments open more rapidly beginning at twilight. When blooming time arrives, it literally opens before one's eyes as if by magic. The movement of the segments is plainly visible as they adjust themselves to the various stages in the process of opening. The time required for complete opening varies from three quarters of an hour to one hour and thirty minutes depending upon the environmental conditions.

In the Summer of 1937 when our first specimen of this species was to flower, we arranged a supper party and the guests enjoyed with us the thrill of observing the opening of the flower. The flower began to open at about 6 p. m. and a pleasant fragrance reminiscent of crinums was outstanding from the very start of segment separation. At 6:30 p. m. the segments were about one-fourth open and the stigma and anthers were plainly visible. Fifteen minutes later the petaline segments were three-fourths open while the sepaline segments were expanded only one half. At this point the fragrance reached its maximum intensity. By 7:15 p. m. the petaline segments appeared to stand still while the sepaline segments opened very rapidly until they were in line. Then very rapid spread followed and the flower was completely open by 7:30 p. m. For a short time the segments drooped gracefully below the horizontal plane, but by 7:45 p. m. they had returned to the horizontal position which was retained during the life of the flower through the following day.

It is interesting to note that at 8 p. m. the stigma was apparently receptive and the anthers while still upright were curved slightly outward at the top. At this time an examination showed that pollen was beginning to shed. Since the tube of this species is $4\frac{1}{2}$ inches in length early pollination might be essential in setting seeds. The flower was accordingly self-pollinated fifteen minutes after complete opening. In two days the ovary began to swell indicating that fertilization was successfully accomplished.

 THE GENERIC NAME AMARYLLIS ACCORDING
TO WILLIAM HERBERT

Questions concerning the generic name *Amaryllis* are perennial, and it seems advisable to reprint a passage from Herbert's *Amaryllidaceae*, 1837, pp. 144-145, in order to show how the *Hippeastrum*-*Amaryllis* mix-up happened,—

Many years ago, when in a letter published in the Hort. Soc. Trans., I first distinguished this genus (*Hippeastrum*) from the plants with which it had been confounded, I retained for it the name *Amaryllis*, and proposed that of

Coburghia for Belladonna and Blanda. I was not then aware that Linnaeus had given the name Amaryllis to Belladonna, with a playful reason assigned; but as soon as I learnt it, I felt, besides the general law of priority, that the *Jeu d'esprit* of a distinguished man ought not to be superceded, and that no continental botanist would submit to the change. I therefore restored the name Amaryllis to Belladonna, and gave that of Hippeastrum or Equestrian star to this genus, following up the idea of Linnaeus when he named one of the original species equestre. Mr. Sweet has improperly given the name Amaryllis to these bulbs, and made Belladonna a generic name, to which he subjoined a new specific one. This was doubly wrong, for with his view he ought to have adopted the proposed name Coburghia, which has been since applied to another genus.

The first institution of the genus Amaryllis was by Linnaeus in Hort. Clifford. p. 135, published in 1737. The name was given expressly to supercede Tournefort's Lilio-narcissus, which he rejected as a compound word. It so happens that a few species enumerated there by Linnaeus are of different genera as Sprekelia, Zephyranthes, Nerine and Oporanthus; and it was meant to comprise every thing called Lilio-narcissus by Tournefort: but he says that he gives the title in allusion to the name Belladonna, by which several species were known, because Amaryllis was the bella donna of Virgil, and her name was become proverbial for loveliness; and he adds a further conceit, that some of the bulbs were said to be bitter, *amarellas*. Amaryllis belladonna is not one of the few species defined in that article, because, though he knew of its existence, he had it not to enumerate from the Clifford garden.

Mr. Sweet was perhaps misled by knowing that equestre, which is one of the plants described, was called belladonna by Merian; but Merian only called it *another belladonna*, with reference to the plant of the Italian gardens, thinking erroneously that it was of the same genus. Barrelius had previously, in the year 1714, described the pink and white belladonna, as cultivated by that name in the gardens of Italy, and to the plant of Barrelius both Merian and Linnaeus alluded. It was the exquisite blending of pink and white in that flower, as in the female complexion, that suggested the common name in Italy, and to those lovely tints Linnaeus referred, when he assigned to it the name of a beautiful woman. To suppose he could have alluded to a bright orange flower would be perfectly absurd.

LYCORIS RADIATA AND NERINE SARNIENSIS

RUSSELL S. WOLFE, *South Carolina*

For about thirty years that I can remember, and perhaps many years longer, there have been naturalized in my yard many bulbs of red "Spider Lily" or "Surprise Lily" that, I was told, were properly named *Nerine sarniensis*; and, it seems that many other people had accepted that name as the proper one.

During the fall of 1936, I had an opportunity to compare the naturalized bulbs and flowers of my "*Nerine sarniensis*" with those of *Lycoris radiata* just imported from Japan. The imported bulbs (*Lycoris radiata*) were small (probably due to import regulations) and had a decided "hip" next to the neck, and the necks were small. The naturalized bulbs (supposedly *Nerine sarniensis*) averaged much larger, with practically no "hip," the bulbs tapering smoothly into a long, strong neck. Perhaps this difference could be due to different cultural conditions.

The blooms appeared similar, except that the florets and flower stems of the imported *Lycoris radiata* were slightly smaller and the subsequent foliage growth not quite as vigorous which perhaps was due to



Miss Mary McD. Beirne

See page 161

Pure White Giant Leedsii Narcissus—Mary Beirne



Wyndham Hayward

See page 144

Flower of Aloma Daylily
Natural size

Plate 61

the fact that these bulbs were planted when received during August 1936 and flowered a few weeks later, and, the bulbs were small.

These slight differences in the *Lycoris radiata* imported from Japan, and the naturalized supposedly *Nerine sarniensis* may entirely disappear in another season or so when the recently imported *Lycoris radiata* have become thoroughly acclimated.

NERINE—LYCORIS ERROR DISCLOSED

WYNDHAM HAYWARD, *Florida*

Through the cooperation of the Brooklyn Botanic Garden and Dr. Henry K. Svenson, Curator of the Herbarium at the institution, the American Amaryllis Society has been able to ascertain definitely that many thousands of bulbs which have been grown as *Nerine sarniensis*, the Guernsey Lily, (Plate 55) in the South and Southwest for many years, are in reality *Lycoris radiata* (Plate 56), an interesting amaryllid from Japan.

First indications of the mistake in nomenclature were published in 1936 by Mrs. Jerome W. Coombs in the *Gardeners Chronicle* (American) and by W. M. James and the writer in the 1936 *Herbertia*. *Nerine sarniensis* is a native of South Africa, and *Lycoris radiata*, while it has been termed horticulturally the "Japanese Nerine", is quite a different plant in growth, habit and appearance.

An appeal was made to the Brooklyn Botanic Garden in June, 1936 and bulbs from a number of plantings over the South and in California were submitted for identification. These were brought into flower and proved to be *Lycoris radiata* without exception. Dr. Svenson also supplied the writer with quotations from the literature. The original illustration of *Nerine sarniensis* in Curtis's Botanical magazine is reproduced for comparison (Plate 55). Careful examination of hundreds of the bulbs in bloom in the collections of various growers in Florida, likewise showed that beyond all doubt the bulbs were the genuine *Lycoris radiata* (Plate 56).

Main distinctions between the two species, besides the difference in natural habitat include the following—Seeds of *Nerine sarniensis* are green and those of *Lycoris* are black. The leaves of *Nerine sarniensis* are broad and flat, light green in color and those of *Lycoris radiata* are narrow, seldom more than $\frac{3}{8}$ inch wide, and are channeled, with a lighter green-gray stripe down the upper side of the leaf. The petals and sepals of *Nerine sarniensis* are considerably wider than those of *L. radiata*. The flowers of *L. radiata* are erect, with protruding stamens, all on a single rotary plane; in other words, the flowers and projecting stamens "radiate" about the stem. The umbels of *Nerine sarniensis* are loose and irregular. The bulb scales of the true nerines have tiny silk-like fibers in them, which *L. radiata* lacks.

Both plants have the habit of going dormant in summer, and blooming in the late summer or early fall, without leaves, which are produced during the winter and spring. *Lycoris radiata* is quite hardy, as its sistership to *L. squamigera* might lead one to believe. Its outstanding

character, however, is its extreme vigor and ability to adapt itself to numerous soil types. The bulbs will grow and thrive in poor soil, next to shrubs and trees, along a stony walk, etc., where most bulbous plants would be a complete failure.

The original illustration of *Nerine sarniensis* (*Amaryllis sarniensis*) as published in Curtis's Botanic Magazine, Vol. IX, X, p. 294, shows the character of the Nerine. It can be readily seen that it is quite unlike the supposed "Guernsey Lily," now known to be *L. radiata*, which has been a bright decoration of so many Southern gardens for generations.

Disclosure of the identity of this amaryllid as *L. radiata* has been somewhat of a shock to numerous of the older botanists in the Southern states who have known and admired them for a lifetime as *Nerine sarniensis*. As previously recounted, the error in nomenclature was first noted on examination of foliage and flowers of bulbs of *Lycoris radiata* recently imported direct from Japan, in the belief that they were a very rare plant in the United States.

On the other hand it now appears that *Nerine sarniensis*, the genuine species, is practically non-existent in the United States, unless possibly in private collections. Diligent search has failed to reveal more than a few bulbs, while there are thousands upon thousands of bulbs of *L. radiata* naturalized throughout the South and Southwest.

Experience with small seedling bulbs of *Nerine sarniensis* furnished through the kindness of Mr. W. M. James indicates that the true *Nerine sarniensis* may be unsuited for such general popularity and use in garden planting in warm climates as the *L. radiata* now enjoys. It is less vigorous, slower growing, and more subject to damage from droughts, insects, sunlight, etc., although it may prove to be valuable as a pot plant or bedding bulb for sheltered locations in good soil.

The mystery of how such quantities of *L. radiata* came to be present over the southern part of the United States, and under the name of a South African plant, remains as puzzling as any in modern horticulture. Doubtless the bulbs were brought in from the Far East with early shipments of other plants a hundred or more years ago. On the other hand, the genuine *Nerine sarniensis* is a well known bulb with European collectors, and is frequently found listed in the specialty catalogues of dealers in Holland and England.

Regardless of the change of name, *Lycoris radiata* remains one of the most valuable bulbs of the Amaryllis Family for outdoor planting in the South. The plants are inconspicuous, when not in bloom, although the foliage is truly handsome in itself. Their blooms appear when other flowers are scarce, rising as if by magic from the dry sand or clay soil. The flowers are a bright rose-red, extraordinarily beautiful and last in good condition for many days, making an excellent cut flower. The bulbs will grow almost anywhere except in a sour, soggy soil.

Lycoris aurea is a well known bulb in Florida, being found in abundance in old gardens about St. Augustine. *Lycoris squamigera*, the "hardy amaryllis" is grown as far north as Massachusetts and Ohio. These are the only species of *Lycoris* commonly available in the United States.

NOTES ON FLORIDA HYMENOCALLIS

MARY W. DIDDELL, *Florida*

The Amaryllis family holds no more lovely genus than *Hymenocallis*, and we have in Florida nine species and perhaps ten belonging to this Subdivision. The name, *Hymenocallis*, means beautiful membrane, referring, of course, to the membranous staminal cup which is the most conspicuous feature of the flower.

My first acquaintance with hymenocallis, in its native habitat, was several years ago, when I found *H. occidentalis* growing in mud-flats in the Satilla River, in south-east Georgia, where the natives call it "Easter Lily", because it usually blooms at Easter. As the Satilla River is only a few miles north of the St. Mary's River, I think it is very probable that this species will be found in northern Florida, though as yet I have not come across it.

For several years I have hoped to make a thorough study of all of our native *Hymenocallis* species, but for various reasons in past years I have been prevented from going out into the woods and river banks to collect them at their blooming season. For several months past, I have been on the lookout for the plants on every trip into the woods, and have collected the bulbs and brought them home and planted them, keeping them as wet as possible, but owing to a late and freakish season this year only one has come into bloom. This is *H. coronaria*, and Dr. Small gives it range from Florida to Alabama and South Carolina. This one bulb appeared sometime ago in some irises which I had brought in from the woods and I took it out of the iris bed and transferred it to a small pool in the fern garden, where it bloomed again this year. From the bloom alone it would be difficult to tell whether it is *H. coronaria* or *H. laciniata* as it fits the description of both in Dr. Small's Manual. The nine leaves, however, arising from a short, globose bulb, are about twenty-five inches long, rich, shining green and shallowly channeled, which places it as *H. coronaria* for he described *H. laciniata* as having few leaves. Dr. Small further states of *H. coronaria*,—"Bulbs said not to produce stolons." This one bulb, so far, has not produced stolons, but other bulbs, identical in appearance, which I recently found in a swamp, but which have not yet bloomed, are stoloniferous.

Our native *Crinum americanum* occurs in many places in Florida where it can find enough moisture in full sun or deep shade. I have seen, at low tide, swampy areas so covered with the seeds that it was impossible to walk without stepping on several at once, but hymenocallis are more "choosy." The swamp species are found on the edges of swamps, or near streams, back in the deep shade, usually in soft mud. They are scattered over a small area, in segregated colonies of not more than a few hundred plants of the same species, though I know one spot where there are two colonies, representing two species, a quarter of a mile or less, apart.

There is considerable difference in the appearance of the plants of the different species, so that as a rule one could not be mistaken for another. In addition to the variation in the number of leaves to the

(Continued on page 161)

THE HORTICULTURAL STATUS OF DAYLILIES

A. B. STOUT,¹ *The New York Botanical Garden*

It would seem that the main objectives in the efforts of the proposed *Hemerocallis* (Daylily) Committee of The American Amaryllis Society are rather clearly determined in the need which exists for the evaluation of the daylilies according to merit and class and for information regarding the cultural behavior of the different types and classes of daylilies in gardens in different climatic areas, especially of America.

I. THE EVALUATION OF DAYLILIES

The horticultural group of daylilies are now in that stage of development which is characterized by a somewhat rapid and indiscriminate increase of clonal varieties many of which have no distinctive merit. The first of the hybrid daylilies which were named for culture appeared about 1890 and the number of such clones steadily increased until in 1934 there were records for 174 different horticultural clones which were listed in the chapter "The Horticultural Clones of Daylilies" in the book "Daylilies", published in March 1934. Since that date, a span of only three years, according to letters and catalogs which have come to hand, *97 new clones have been named.*² Also a considerable number of persons who have not yet named any plants are growing seedlings in considerable numbers of which at least some are certain to be introduced into culture.

The situation in respect to daylilies may be viewed impersonally and in the light of the history of the more extended development of other groups of garden plants, such as the irises, the dahlias, and the roses. An increase in the popular interest in any plant, such as the group of daylilies is now experiencing, is reflected in a general increase in "breeding." In the case of plants propagated vegetatively, as irises, dahlias, roses, daylilies, etc., most of this breeding is merely obtaining seed from hybrid clones and if there is more or less cross-pollination this is usually uncontrolled. As a rule the seedlings thus obtained from plants that are themselves hybrids show considerable variation. Often no two are exactly alike but the differences may not be very distinctive. Frequently the seedlings are grown by persons who have seen few types of the plant in question and have little critical judgment of the relative merits of their seedlings. Also certain nurserymen may grow seedlings and introduce them in considerable number without much regard to their real merits or distinctions.

Thus it happens that numerous seedlings are propagated, named as horticultural clones, and listed for sale to a public that is interested. But some of these clones are very much alike; many are not much different from and no better than certain of the older varieties; many are outranked by certain clones which may not be widely known. The average gardener is unable to distinguish between various of the clonal varieties; and he is often disappointed with varieties for which he may pay a goodly price.

¹ Chairman, *Hemerocallis* Committee.

² See page 144.

Thus there arises a decided need for the critical evaluation of the different clonal varieties. Perhaps an organization, as for example the American Iris Society, officially establishes a code for the rating of varieties by a committee of judges. But, whether or not this is done, in time experience indicates what varieties thrive best in different climatic areas. Also gardeners become more fully acquainted not only with the many varieties but with the different classes in which varieties belong, and their preferences become somewhat crystallized into a public evaluation of what constitute the best classes and the best clones in each class. At this stage the situation provides a natural check on the introduction of mediocre plants from indiscriminate breeding. New varieties which receive much attention must possess merit and either be better than the older clones or of a somewhat distinctly new type. There will always be opportunity for breeders to develop such plants.

A survey of the 250 or so horticultural daylilies now in existence will reveal to anyone that numerous varieties have neither distinctive characters nor special merit for garden culture. This holds for a considerable number of the clones named during the past three years. But any adequate evaluation of the daylilies must recognize that the group of horticultural daylilies has now become so diverse that there are distinct classes in each of which there are outstanding plants of decided charm, merit, and individuality. In respect to the season of bloom at New York a selection of types may be made which will provide a succession of bloom from early May until late in September. In stature there is a range from less than a foot tall to as much as six feet. There are several distinct classes in respect to habits of growth and to size and shape of flowers. The new flower colors give various classes such as the bicolor pattern, the eyed pattern (as in the Mikado Daylily), a type with rich shades of crimson red, a very distinct class in dark mahogany red (as in the Theron Daylily), and others. The extensive use of the autumn-flowering small-flowered *H. multiflora* in hybridization followed by selective breeding has given small-flowered plants in a wide range in habits of growth, stature, season of bloom, and color of flowers. Selections of the best individuals in various of these new classes have been made for propagation and garden culture. In regard to the number of named varieties, and the number of somewhat distinct classes the group of horticultural daylilies is rapidly expanding. The limits in the development of new types are certainly not yet in sight.

Perhaps the writer may be allowed the comment that the development of new types of daylilies seems to have outdistanced the realization and appreciation of the general gardening public. Daylilies are to most people merely daylilies. "Will you name the best daylily?" is a frequent request.

At the New York Botanical Garden there is a display garden in which nearly all known species of daylilies are represented and at least one plant grown of most of the named clones. There is also an experimental garden in which are some 500 plants selected as the most outstanding of about 50,000 seedlings obtained by hybridizations and selective breeding. There are also several thousand seedlings of recent breeding.

Many gardeners and nurserymen visit these collections of living plants. With very few exceptions the selections which these visitors make are based on personal tastes and are limited to few classes or to one class. Certain persons will select only clear colors in yellow or orange. Others will prefer the newer dark red or crimson red colors. Some will not look at any type which has any shade of fulvous coloring. Some are attracted to dwarf plants of which there are a considerable number of seedlings but others will remark that it is a waste of time and effort to be breeding for dwarf clones no matter how fine their flowers may be. More persons are pleased with the pink-flowered type than with any other one class. The reactions of these numerous gardeners lead me to conclude that there has not yet developed in the general gardening public, or even in that portion of it that is interested in daylilies, a sense of the horticultural classes of daylilies and of their relative values. This it seems must necessarily be the basis for the evaluation of the various individual clones. The question now is not what is the best daylily, but what clone is to be ranked most highly in a certain class: as for example, in the *dwarf, early-flowering, and red-flowered class*; or in the class that is *semi-robust, summer-flowering, and mahogany red*; and in other specific classes.

The first step in the evaluation and selection of daylilies is, it seems to the writer, the recognition of the main horticultural classes which exist in respect to (1) stature and habits of growth, (2) flowering habits, and (3) characters of flowers. An attempt to outline the limits of these classes was made by the writer in the chapter on "The Evaluation of Daylilies" in the volume "Daylilies", and in an article published in *Herbertia*, volume 3, pages 99-103. Perhaps a more definite standardization of classes and the listing of varieties typical of each class could now be attempted.

II. THE CULTURAL BEHAVIOR OF DAYLILIES

The value of any daylily for garden culture in a given region depends primarily on its response or behavior to the enforced and fixed conditions of climate that exist. The plant must thrive reasonably well or it cannot be recommended for general garden culture.

The cultural responses of most species and clones of daylilies are fairly well known for the more northern states. However, more definite data for local conditions are being obtained in various test gardens recently established in various northern states. At The New York Botanical Garden special effort is made to test plants of all species and horticultural clones for their cultural reactions. Special studies of the behavior of daylilies are also in progress at the State Experiment Station at Gainesville, Florida, under the direction of Professor H. Harold Hume. For other and somewhat different climatic areas of the United States the information regarding the behavior of daylilies is less adequate. Few of the different species and clones have been widely grown and also the experiences which growers and nurserymen have had with daylilies have not been assembled.

The wild daylilies (*Hemerocallis*) are all native of the temperate regions of central and northern Asia. They are naturally plants of the temperate zone. Yet some of them also thrive in tropical lands. For example the *Hemerocallis fulva* clone Europa has become one of the most cosmopolitan of garden plants and it seems that this clone thrives anywhere in temperate and tropical lands wherever out-door gardens are a success. But it does not follow that all of the species of the genus and that all of the horticultural clones will also thrive under a similar range of diverse climatic conditions.

The species that are fully hardy at New York are the early-flowering *Hemerocallis minor*, *H. Dumortierii* and *H. Middendorffii*, the summer-flowering *H. Thunbergii*, *H. citrina* and *H. exaltata*, and the late-summer and autumn-flowering *H. multiflora*. The foliage of these dies early in autumn and new shoots are suppressed until early in the following spring. Many of the hybrid horticultural clones which have one or more of these species in their ancestry are also full hardy. It is known that some of these daylilies do not thrive in Florida. Possibly the habit of dormancy during winter is necessary to their well being.

The early-flowering clone which is the botanical type of the species *H. flava* is fully hardy over a considerable portion of the temperate zone. This clone produces seed to self-pollination and from such seed numerous seedlings have been grown at The New York Botanical Garden. Not one has been hardy; the main buds are killed each winter and the new shoots from dormant buds of stems buried in the soil make weak growth during the following summer and seldom produce flower scapes. In this instance a plant which is *hardy* produces selfed offspring which are *not hardy*.

Wild plants which are to be included in the species *H. fulva* have been obtained from widely separated localities in Japan, China, and northern India. Mostly the foliage of these, and also of the older cultivated clones of this species, remains green and lush until severe freezes occur. Some plants suffer from winter injury. Various of the fulvous seedlings obtained, and especially in breeding for the pink-flowered type (*H. fulva rosea*), have not been hardy at New York.

The so-called *H. aurantiaca* and the *H. aurantiaca* clone Major have what may be termed a fully evergreen habit. At New York these types remain more or less green throughout the winter. The type clone of *H. aurantiaca* survives and blooms well but the clone Major is often killed unless it is protected by a covering such as is provided with salt hay.

Numerous hybrids including many of the ones named as horticultural clones have an evergreen or semi-evergreen habit and the main buds suffer more or less injury at New York from winter killing. But often the new growth from lower buds is vigorous and the plants bloom well.

It is reported in semi-tropical regions that daylilies of the evergreen type thrive especially well, remain lush and green throughout the year, and may have a somewhat extended or continuous blooming.



Fr. Meyer, Hamburg, Germany

Narcissus schizocoronatus—

Left, *Narcissus pseudonarcissus schizocoronatus* "Buttonhole";
 Right, *Narcissus* "King Alfred" (pistillate parent) X "Gigantic Orchidflower" (pollen parent).

See page 182

See page 185

Narcissus schizocoronatus—
Left, *Narcissus incomparabilis* "Confidence" X "Gigantic Orchidflower";
Right, *Narcissus schizocoronatus* "Vorstin" ("Buttonhole" X "King Alfred").

Fr. Meyer, Hamburg, Germany

Very little can be reported regarding the culture of the dwarf species *H. nana*. Its culture does not appear to be very successful or general in Europe and at New York plants of this species have grown poorly and soon died when grown in outdoor culture, or in cold frames or in pots in greenhouses. This species grows wild in the uplands of southwestern China but evidently it is only found below the snow line. It would seem that somewhere in United States the conditions will be favorable for the successful garden culture of this interesting and perhaps valuable species. It has, however, been hybridized with hardy types and seedlings obtained that are fully hardy at New York.

There is also limited information regarding the cultural requirements of *H. plicata* and *H. Forrestii*. These two species have been confused in both botanical and horticultural literature. Plants grown from seed collected in China and which appear to be the true *H. Forrestii* have lived in out-of-door plantings at The New York Botanical Garden.

Possibly a Daylily Committee operating in the American Amaryllis Society may be able to render a service to those gardeners who wish to grow daylilies in the various parts of America and especially in sections where few kinds of daylilies are now known. Perhaps there is some information of value which awaits compilation by such a committee. But it is somewhat evident that the needed information on the matters discussed above may be provided most fully and quickly from test gardens in which plants of some of the species and of the best clones of each of the various horticultural classes are grown and their behavior noted. Such gardens could be under private, semi-private, or public ownership, or under the auspices of garden clubs, horticultural departments of experiment stations, or otherwise. These gardens would not only be test gardens but objective display gardens in which gardeners would see numerous kinds of daylilies and make their own selections and evaluations.

CLASSIFICATION OF HYBRID AMARYLLIS (HIPPEASTRUM) FLOWER TYPES

Revised for 1938 and 1939 shows: Hybrid amaryllis shall be subdivided tentatively into the following types on the basis of the characters indicated below,—

FLOWER TYPES

- A. Flowers distinctly drooping, tube long (over 3 inches long)
 - B. Tube very long (over 4 inches) *Solandriflorum Type A*
 - BB. Tube shorter (3 to 4 inches) *Solandriflorum Type B*
- AA. Flowers slightly upright, horizontal or slightly drooping, tube short
 - C. Tube narrow, (1 to 3 inches)
 - D. flower compact, *Reginae Type A*
 - DD. flower pointed, *Reginae Type B*
 - CC. Tube open (to 1 inch)
 - E. flower compact, *Leopoldi Type A*
 - EE. flower pointed, *Leopoldi Type B*

EXHIBITION GROUPS

For exhibition purposes there shall be three major groups, (1) Grandiflora classes in which flower form and size standards are the important considerations; (2) Decorative classes in which the use of the plant—landscape, rock garden, forcing, etc., shall be the important considerations, and (3) Double flowering classes.

CLASSES AND AWARDS (PRIZE SCHEDULE)

At the annual National Amaryllis Show, and at other exhibitions, as voted by the Board of Directors, the Society will award its First Class Certificate for meritorious new and standard varieties; its award of merit; and its first, second, third and fourth prize ribbons, in the classes indicated below. Any money prizes offered shall be authorized by action of the Board of Directors.

Each species or varietal exhibit shall consist of one or more potted flowering plants, or one or more flower scapes up to and including 1945; after which date three potted flowering plants or three flower scapes shall be required in each case.

SECTION A. AMARYLLIS (GENUS HIPPEASTRUM)

- Class 1. Single entries of *Hippeastrum* species.
- Class 2. Best collection of botanical species and varieties.
- Class 3. Best collection of 10 or more Grandiflora varieties.
- Class 4. Best collection of 5 to 10 Grandiflora varieties.
- Class 5. Best collection of 10 or more Decorative varieties.
- Class 6. Best collection of 5 to 10 Decorative varieties.
- Class 7. Best hybrid amaryllis floral arrangement.
- Class 8. Best amaryllid floral arrangement.
- Class 9. Best display.
- Class 10. Best bloom in Show.

Standard Grandiflora and Decorative Varieties

The score card, and prize schedule are reproduced on the two following pages.

Classes of Grandiflora, Decorative and Double Varieties (Prize Schedule)

COLOR CLASSIFICATION (Fischer Color Chart)	Grandiflora Group						Decorative Group	Double Group
	Leopoldi- Type A	Leopoldi- Type B	Reginae Type A	Reginae Type B	Solandri- florum Type A	Solandri- florum Type B		
White without markings.....	101	151	201	251	301	351	401	451
White with slight pale red markings.....	102	152	202	252	302	352	402	452
White with lighter red markings.....	103	153	203	253	303	353	403	453
White with lighter red stripes, keels, stars, tips, etc.	104	154	204	254	304	354	404	454
White with red stripes, keels, stars, tips, etc.	105	155	205	255	305	355	405	455
Yellow without markings.....	106	156	206	256	306	356	406	456
Yellow with markings.....	107	157	207	257	307	357	407	457
Bronze without markings.....	108	158	208	258	308	358	408	458
Bronze with slight markings.....	109	159	209	259	309	359	409	459
Bronze with distinct markings.....	110	160	210	260	310	360	410	460
Orange without markings.....	111	161	211	261	311	361	411	461
Orange with slight markings.....	112	162	212	262	312	362	412	462
Orange with distinct markings.....	113	163	213	263	313	363	413	463
Pale red without markings.....	114	164	214	264	314	364	414	464
Pale red with slight markings.....	115	165	215	265	315	365	415	465
Pale red with distinct markings.....	116	166	216	266	316	366	416	466
Lighter red to light red without markings..	117	167	217	267	317	367	417	467
Lighter red to light red with slight markings	118	168	218	268	318	368	418	468
Lighter red to light red with distinct markings	119	169	219	269	319	369	419	469
Red without markings.....	120	170	220	270	320	370	420	470
Red with slight markings.....	121	171	221	271	321	371	421	471
Red with distinct markings.....	122	172	222	272	322	372	422	472
Dark red.....	123	173	223	273	323	373	423	473
Darker red.....	124	174	224	274	324	374	424	474
Violet red.....	125	175	225	275	325	375	425	475
Rainbow and tri-color types, excluding green	126	176	226	276	326	376	426	476
Any other color.....	127	177	227	277	327	377	427	477
Best bloom of type.....	149	199	249	399	349	399	449	499

Score Card—Grandiflora group¹ Hybrid Amaryllis (*Hippeastrum*)

All flowers to be expanded in ½ or more direct sunlight.

Color Class No..... Exhibitor's No.....

Flower Type.....

CHARACTER TO BE SCORED	METHOD OF RATING	POSSIBLE SCORE
Color and texture	No flower of inferior color to be considered; the full 50 points to be deducted for major color defects; dark green in combination with medium and dark red is especially objectionable.	50
Form	Rating should be based on conformity to type.	15
Size	Except in the case of Solandriflorum types, the following shall rule (diameter across face): 6" to 7", allow 10 points; 7" to 9", allow 13 points; 9" and above, allow 15 points.	15
Habit	For Solandriflorum types the drooping habit is normal; but for Reginae and Leopoldi types, horizontal and slightly erect carriage are to be favored, although slight drooping is allowable.	5
Number of flowers to scape	For less than 3 or more than 5 allow 2 points; for 3 to 5 allow 5 points.	5
Length of scape	The length should be considered in relation to size of flower; scapes too short or too long should be penalized	5
Character of scape	Scapes should not be so coarse as to be conspicuous, but should be sturdy enough to hold up flower well	3
Fragrance	Should not be too faint or too strong	2

¹ NOTE: No entry is to receive first prize unless a rating of at least 86 points is merited; second and third prizes may be awarded to entries rating from 76 points up. A Score Card for the Decorative group is in preparation.

SECTION B. HEMEROCALLIDS

- Class 601 Best collection of *HEMEROCALLIS* species (Daylilies).
 Class 602 Best collection of hybrid Hemerocallis varieties.
 Class 603 Best Display of hybrid Hemerocallis varieties.
 Class 610 Best hybrid Hemerocallis bloom in show.
 Class 621 Single entries of hybrid Hemerocallis varieties.

Class 651 *HOSTA* (Plantain Lilies)

Class 661 *LEUCOCRINUM*

Class 671 *HESPEROCALLIS*

SECTION C. AMARYLLIDS (EXCEPT GENUS HIPPEASTRUM;

SEE SECTION A, ABOVE)

- Class 701 Best collection of *AGAPAN-*
THEAE
 Class 702 Agapanthus

Class 703 Tulbaghia

- Class 751 Best collection of *ALLIEAE*
 Class 752 Bloomeria
 Class 753 Muilla
 Class 754 Allium
 Class 755 Nothoscordum
 Class 756 Tristagma
 Class 757 Steinmannia
 Class 758 Brodiaea

- Class 759 Diphalangium
 Class 760 Milla
 Class 761 Androstephium
 Class 762 Behria
 Class 763 Bessera
 Class 764 Leucocoryne
 Class 765 Stropholirion
 Class 766 Brevoortia

- Class 801 Best collection of *GILLIE-*
SIEAE
 Class 802 Erinna
 Class 803 Solaria
 Class 804 Speea
 Class 805 Trichlora

- Class 806 Miersia
 Class 807 Gilliesia
 Class 808 Gethyum
 Class 809 Ancrumia

- Class 851 Best collection of *GALAN-*
THEAE
 Class 852 Galanthus

- Class 853 Lapiedra
 Class 854 Leucojum

- Class 901 Best collection of *AMARYLL-*
LIDEAE
 Class 902 Amaryllis (Belladonna)
 Class 903 Brunsvigia

- Class 904 Ungernia
 Class 905 Nerine

- Class 951 Best collection of *CRINEAE*
 Class 952 Chlidanthus
 Class 953 Crinum
 Class 954 Ammocharis

- Class 955 Cyrtanthus
 Class 956 Stenolirion
 Class 957 Vallota

- Class 1001 Best collection of *ZEPHY-*
RANTHEAE
 Class 1002 Zephyranthes
 Class 1003 Cooperia
 Class 1004 Haylockia

- Class 1005 Crocopsis
 Class 1006 Apodolirion
 Class 1007 Sternbergia
 Class 1008 Gethyllis

Class 1051 Best collection of *HAEMANTHEAE*

Class 1052 Hessea
Class 1053 Carpolyza
Class 1054 Strumaria

Class 1055 Buphane
Class 1056 Griffinia
Class 1057 Clivia
Class 1058 Haemanthus
Class 1059 Choananthus

Class 1101 Best collection of *IXIOLIRION* species

Class 1151 Best collection of *EUCH-ARIDEAE*

Class 1152 Hyline
Class 1153 Stenomesson
Class 1154 Pamianthe
Class 1155 Pancratium
Class 1156 Elisena
Class 1157 Ismene

Class 1158 Hymenocallis
Class 1159 Calostemma
Class 1160 Calliphruria
Class 1161 Eucharis
Class 1162 Stricklandia
Class 1163 Eurycles
Class 1164 Klingia

Class 1201 Best collection of *EUSTEPHIEAE*

Class 1202 Urceolina
Class 1203 Hieronymiella
Class 1204 Eustephia

Class 1205 Eustephiopsis
Class 1206 Callipsyche
Class 1207 Eucrosia
Class 1208 Phaedranassa

Class 1251 Best collection of *HIPPEASTREAE* (Except Genus Hippeastrum)

Class 1252 Placea
Class 1253 Habranthus

Class 1254 Sprekelia
Class 1255 Lycoris
Class 1256 Vagaria

Class 1401 Best collection of *NARCISSEAE*

Class 1402 Cryptostephanus
Class 1403 Tapeinanthus
Class 1404 Best collection of *Narcissus* species
Class 1405 Trumpet *Narcissi*
Class 1406 *Incomparabilis Narcissi*
Class 1407 *Barrii* (also *Burbridgi*) *Narcissi*

Class 1408 *Leedsii Narcissi*
Class 1409 *Triandrus Narcissi*
Class 1410 *Cyclamineus Narcissi*
Class 1411 *Jonquilla Narcissi*
Class 1412 *Tazetta* and *Tazetta Hybrid Narcissi*
Class 1413 *Poeticus Narcissi*
Class 1414 *Double Narcissi*
Class 1415 *Cleft-corona Narcissi*

SECTION D. ALSTROEMERIALES

Class 1501 Best collection of *ALSTROEMERIACEAE*

Class 1502 *Alstroemeria*
Class 1503 *Bomarea*

Class 1504 *Leontochir*
Class 1505 *Schickendantzia*

Class 1551 *PETERMANNIA*

Class 1601 Best Collection of *PHILESIACEAE*

Class 1602 *Luzuriaga*
Class 1603 *Philesia*
Class 1604 *Lapageria*

Class 1605 *Eustrephus*
Class 1606 *Elachanthera*
Class 1607 *Geitonoplesium*
Class 1608 *Behnia*

REGISTRATION OF NEW VARIETIES

Descriptions of new varieties of hybrid amaryllids, hemerocallids, and alstroemerids for this section must reach the Secretary not later than June 1 to be included in the current issue of *Herbertia*. This information is published to avoid duplication of names, and to provide a place for the authentic recording of descriptions. Names should be as short as possible—one word is sufficient. It is suggested that in no case should more than two words be used.

NEW HYBRID AMARYLLIS (HIPPEASTRUM) VARIETIES

Introduced by John R. Springer, Orlando, Florida;—No. S-1, *Florence Springer*, Reginae type A, vigorous grower, bulb 3"; 7 leaves (evergreen), up to 20" in length, 1/2" to 2" wide; Peduncle 24" long, 13/16" wide; two scapes with 4 to 5 flowers to the scape; flowers held horizontally, tube 1-2/16" long, and 7" across face; flower color—medium red (Maerz and Paul, 2-L-8), fine white penciling in throat and center of segments and a white hairline at rim of segments, sometimes this line is broken. Apparently mostly of *H. psittacinum* ancestry.

Introduced by the American Amaryllis Society, 1937, acting for the Garfield Park Conservatory, Chicago, Ill.,—

GARFIELDII, (Syn. *Hippecoris Garfieldii*, No. 30), Decorative type, bright orange red with darker star; normally two scapes per bulb, and four flowers to the scape; a most excellent forcing variety.

AUGUST KOCH, (Syn. *Hippecoris Garfieldii* No. 13), Decorative type, bright orange red with pale yellowish star; normally two scapes per bulb and four flowers to the scape; a most excellent forcing variety.

In addition, the following decorative varieties (formerly classed as *Hippecoris Garfieldii*) have been distributed to members for trial under numbers,—13, 17, 18, 19, 24, 27, 30, 39, 40, 56, 57 and 68.

Members receiving any of these should keep them properly labeled in their collections for some of these may be given names later on. The names tentatively considered for some of these numbered varieties are,—*Chicago*, *Robert Van Tress*, *Illinois*. Members receiving any of the numbered varieties, and also the two named varieties listed above should report their successes and failures in *Herbertia*.

Introduced by Wyndham Hayward, Lakemont Gardens, Winter Park, Fla.,

No. B-12, *Ernestine*, Leopoldi Type B, 9" across face, compact structure; color, lavender rose-red with white keel (See Plate 58).

No. B-24, *Ethel Duckworth*, Leopoldi type B, compact, 8" across face; color, clear velvet red, deeper color in throat, faint lighter shading at perianth segment tips (See Plate 59).

No. B-3, *Mary Davis*, Leopoldi type B, compact, 7" to 8" across face; color, pure white with light green throat; first prize at Central Florida Exposition, Orlando, Fla., Feb. 1937. (See Plate 57)

Introduced by Hamilton P. Traub and A. E. Hughes, Orlando, Fla. All of these were produced by crossing the 10 1/2" almost pure white variety *Marina* on various light shaded Mead hybrids.

No. TH-1, *Ella Maie Stevens*, Leopoldi type B; very vigorous grower bulb 4½" in 18 months under excellent cultivation; 9 leaves, up to 32" in length, 2½" to 3" wide; Peduncle 24" long, 1-⅛" wide; two scapes, and 4 to 6 flowers to the scape; flowers held horizontally, tube ⅞" long; flower 3½" long, and 8" across face; flower color—upper three and upper half of lower side perianth segments white band in center, and red veins on white; lower half of lower side segments and lip, minutely dotted red on white; throat delicate light green, filaments pure white, style green changing to white toward stigma. A cross of *Marina* on a large flowered vittatum type. Variety shows vittatum, pardinum, psittacinum and reticulatum ancestry.

No. TH-2, *Lena B. Hughes*, Leopoldi type B; bulb 3" in 18 months, and 2 offsets under excellent cultivation; 4 leaves, up to 30" in length, 2½" to 2¾" wide; peduncle 28" long, ⅞" wide; two scapes, each with 3 flowers; flowers held horizontally, tube 15/16" and flower 3¾" long, and 8" across the face; flower color—General aspect is that of an exceedingly delicate shade of salmon-rose; white band in center of all segments, upper 3 and upper portion of lower side segments white veined salmon-rose, lower portion of lower 2 side segments and lip white veined salmon; filaments and style delicate light green in throat changing to white and then to pink toward tip; stigma white; segments gold-dusted. Variety shows pardinum, reticulatum and psittacinum parentage. Produced by crossing *Marina*, a 10½" almost pure white on the variety Will Rogers.

No. TH-3. *Princess Elizabeth*, Reginae type B; bulb 3" in 18 months, and 2 offsets, under excellent cultivation; 4 leaves, up to 31" long, 2¼" to 2½" wide; two flower scapes, each with 3 flowers, peduncle 27" long, ¾" wide, flower held slightly upright, tube 1" long, flower 3¾" long, and 7" across face; flower color—brilliant coronation red, delicate light greenish to whitish star, and brilliant royal purple penciling at the base of the segments, the flower as a whole has a cheerful aspect; filaments and style greenish in throat changing to white and coronation red, stigma white. A cross of *Marina* on a large flowered equestre type. Variety shows equestre, and psittacinum ancestry.

No. TH-4, *Emma Piper*, Leopoldi type B; very vigorous grower, bulb 3¾" in 18 months, and 2 offsets, under excellent cultivation; 7 leaves, up to 29" long, 2¼" to 2½" wide; two flower scapes, each with 5 flowers, peduncle 25" long, 1-1/16" wide, flower held slightly upright; tube 15/16" long; 2½" long, and 8" across face; flower color—upper 3 segments banded white, these segments and upper part of lower 2 side segments veined deep rose on white, lower portions of lower 2 side segments and lip white; throat light greenish; filaments and style light greenish in throat changing to white; stigma white. A cross of *Marina* on a large flowered Vittatum type. Variety shows vittatum, psittacinum and reticulatum ancestry.

A LIST OF THE NEW CLONES OF DAYLILIES

A. B. STOUT¹*New York Botanical Garden*

The following list of daylilies includes clonal varieties concerning which the writer has obtained information since the preparation of the volume *Daylilies* which was published in March, 1934.

For many of these daylilies the data available are somewhat meagre. In most cases mention is here made of the person who grew the seedling and of the first catalog offering. At the *first mention* of a person or firm the address is given. The writer cannot vouch for the accuracy of the descriptions obtained or quoted for various of these daylilies or for their merits as garden plants. Undoubtedly there are other clones tentatively named or possibly already listed for sale of which the writer has no data. Information regarding other daylilies that have already been named or that may be named in the near future for propagation and horticultural culture will be appreciated by the writer.

ALBA STRIATA. Amos Perry, Enfield, England; catalog 1934. Described as "Large open flowers, delightful shade of orange-yellow; as the flowers age half the petals are pure white; very effective; June-July; 2½-3 ft."

ALOMA. Wyndham Hayward, Lakemont Gardens, Winter Park, Florida. Reported by letter in March 1937, as a tentative selection and described as follows: "Flowers upright, full, with spreading pointed petals, marked by waved edges; color clear orange with faint fulvous eye zone; individual flowers 5" across when fully expanded; blooms in April in Florida" (See Plate 61).

ARABY. Wyndham Hayword, Winter Park, Fla. Medium early variety flowering in May in Florida; flowers golden bronze or rich coffee color, with distinct fulvous "eye" zones and golden throat; petals broad and full and of pleasing texture; free flowering habit and quite vigorous. Secured by crossing *Hemerocallis fulva* Europa on one of the Stout varieties.

AUTUMN HAZE. Mrs. Thomas Nesmith, Fairmont Iris Gardens, Lowell, Massachusetts; catalog 1937. Described as "A beautiful open flower of pale apricot with slightly fluted petals and very firm wax-like finish. A late blooming variety that is excellent for front of border. 2½ ft. Aug.-Sept."

BAGDAD. A. B. Stout. Mentioned and flower illustrated in the *Journal of The New York Botanical Garden*, September 1935. Offered to the trade by Farr Nursery Company, Weiser Park, Pa., in autumn 1935. A robust stature of at least 40 inches and flowers with a combina-

¹ Chairman, *Hemerocallis* (Daylily) Committee.



Fr. Meyer, Hamburg, Germany

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Narcissus schizocoronatus—

Upper, *N. incomparabilis* "Confidence" X "Gigantic Orchidflower";
Lower, *N. "King Alfred"* X "Gigantic Orchidflower."



Wyndham Hayward

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McCann Hybrid Double Amaryllis

tion of several rich colors characterize this daylily. The flowers are of medium size, full, and widely open with segments somewhat recurving. In color the throat of flower is clear orange, the blades of the petals are fulvous red over orange giving a shade close to "vinaceous rufous" (of the Color Standards by Ridgway) and the veins and a rather narrow midzone are almost "maddar brown." The blades of the petals are paler and more uniformly of one color. The combination of several colors gives a gay and bold pattern that is both attractive and pleasing. The period of bloom is in July.

This seedling was obtained after several generations of selective breeding for the more sprightly shades of fulvous and orange coloring and it has in its ancestry the species *Hemerocallis flava*, the EUROPA Daylily, a wild plant of *H. fulva* from Japan and the MIKADO Daylily.

BEACON. C. Betscher, Dover, Ohio. Reported to writer by letter from R. V. Ashley, Battle Creek, Michigan. Not yet described or listed for sale.

BEAUTY OF KENT. R. Wallace & Co., Ltd., Tunbridge Wells, England; catalog 1937. Described as "Magnificent deep rich yellow flowers, 5" across. A very fine new variety. June-July. 4 ft."

BERENICE. Perry; catalog autumn 1936. Described as "Large open flowers 5 inches across, tawny-orange-yellow, suffused maddar-red, bold yellow line through each division; free; early July; 2 ft."

BERNSTEIN. This clone has been listed for sale by Karl Foerster, Potsdam-Bornim, Germany, since the year 1929, but it first came to the notice of the writer through mention in Gartenschöenheit 14: 12, Dec. 1933. The following is a translation from a letter received from Mr. Foerster: The *Hemerocallis* Bernstein originated in the garden of Karl Foerster and was derived from *H. aurantiaca* Major. The pollen parent is not known. This variety was put into the market in 1929. In literature on this variety is only represented in the description in our catalogs since the year 1929. Except us, no one carries this variety at present. The color is very pretty light-brownish Bernstein-yellow.

A plant of this clone was obtained from Mr. Foerster for The New York Botanical Garden in 1936. Its flowers are clear orange, medium full, and medium large.

BRETWALDA. George Yeld, Orleton, Gerrards Cross, England. Reported to writer by letter. Not yet described or listed for sale.

BROWNIE. This seedling was one of the early selections made at The New York Botanical Garden for fulvous colors. Later the plant was discarded and propagation discontinued, but by error a division was sent in 1929 from the Farr Nursery Company to the Agricultural Experiment Station at Gainesville, Florida. There it has been used in breeding and tentatively has been named Brownie. Not yet described or listed. Of no special merit and far excelled by later selections.

BURGANDY. Nesmith; catalog 1936. Described as "Sepals and petals are an even tone of wine purple, with pale yellow lighting in the throat. A charming flower of most unusual coloring. 4 ft. July."

BURMAH. Nesmith; catalog 1937. "A very late blooming variety of orange overlaid with rose and copper. Many large well formed flowers in tall well branched stalks. A finer and more brilliant Cressida, and much later in time of bloom. 3½ ft. Aug-Sept."

CHENG TU. Mentioned and flower illustrated in the Journal of The New York Botanical Garden, August 1935. Illustrated and described in Horticulture, Sept. 1935. Offered to trade by the Farr Nursery Co., spring 1937. Plants of this clone were sent originally to The New York Botanical Garden by Mr. W. P. Hsieh of Chengtu University, who stated that the type is commonly cultivated in the Province of Szechuen, China, for the production of the flowers which are gathered and used as food.

In the essential botanical characters this clone is to be included in the species *Hemerocallis fulva*, but it is an unusual type with various individual features which make it an attractive plant for garden culture. It has a good habit of growth, attractive foliage, flowers of sprightly coloring, and its flowering period extends well into August. It is less coarse and has more attractive flower colors than any of the older fulvous daylilies, and it is also different from *H. fulva rosea*.

CHISCA. Hubert F. Fisher, Germantown, Tenn., who reported to writer by letter in 1936 that this is a seedling of MIKADO x SIR MICHAEL FOSTER and that the petals are dark reddish brown and the sepals deep yellow edged with the colors of the petals. Not yet listed for sale.

CIRCE. Stout. Listed by the Farr Nursery Company, Feb. 1937. Illustrated and described in the Journal of The New York Botanical Garden, March, 1937, as follows: "The Circe daylily has been selected as an especially attractive plant from a large number of somewhat similar seedlings which have yellow flowers and bloom in early and mid-July. The scapes stand from 3 to 4 feet tall, and they are stiffly erect and somewhat branched. The flowers are full, about 3½ inches in spread and light yellow or almost lemon-yellow in color. In its particular combination of characters the Circe daylily does not closely resemble any of the various yellow-flowered named clones in bloom at the same time. The ancestry comprises six generations of selective breeding with hybridizations that include *Hemerocallis flava*, *H. fulva* clone EUROPA, *H. Thunbergii* and *H. aurantiaca*."

CURLYPATE. Mrs. Elizabeth Scheffey, West Mansfield, Mass., states that she received "this seedling from a southern garden in a mixed lot of *H. citrina* hybrids." Evidently distributed by Mrs. Scheffey in 1935. Listed by Nevill Primrose Farm, Poulsbo, Washington; catalog 1937, and described as "charming late golden with much curled-back tips, not large but very dainty; free bloomer."

DAINTY. Betscher. Reported by Mrs. Herbert H. Dewey, Schenectady, N. Y., who states she obtained the plant from Mr. Betscher. Said to be pale lemon. Not yet listed.

DAUNTLESS. Stout. Illustrated and briefly described in the Journal of The New York Botanical Garden, Sept., 1935. First offered to the trade by the Farr Nursery Company in autumn with following description: "July, August; 30. The flowers are very full and medium large with rather broad and somewhat spatulate petals. At the base, in the throat of the flower, the color is greenish; the blades of the petals and the sepals are pale yellowish-orange somewhat lighter than cadmium yellow; and in the petals there is an attractive mid-zone of delicate pale fulvous. The colors are in pastel shades that are subdued and delicately blended and the flowers have good texture. The erect branched scapes extend slightly above the upper reaches of the foliage."

DAZZLER. H. A. Dreer Inc., Riverton, New Jersey. First listed in wholesale catalog, 1937. "Flowers about July 1; deep gold; flowers 7 inches in diameter; 3 to 4 ft. tall."

DORA WYMAN. Reported in 1934 by letter for Mrs. Thomas Nesmith who states that this daylily was found in the collection of Mr. Franklin B. Mead. Not yet described or listed for sale.

DOVER. Betscher. First listed by Chas. F. Barber, Troutdale, Oregon, 1932-3. Described as large clear orange flower of heavy substance.

EARLIANA. Betscher. Mentioned in a letter from Mrs. Thomas Nesmith. Not yet described or listed.

EARLIEST LEMON. Betscher. The writer saw a plant with this name at the Bristol Nurseries, Bristol, Conn., in April 1936, and was informed that the plant came from Mr. Betscher.

ELIZABETH PYKE. Perry; catalog 1934. "Middendorffiana x fulva, a very pretty dwarf-growing variety, tufts of graceful foliage, slender stems terminating with loose heads of large open flowers 3 in. across, inner divisions orange-brown, lined sulphur-white, outer divisions pointed orange-yellow, tipped green, conspicuous orange base; very free; 18 in."

EOLA. Dr. Hamilton P. Traub, Mira Flores, Orlando, Florida. Reported by letter in May 1937. "Plant evergreen; foliage up to 24 inches; inflorescence up to 3½ feet with more than 12 flowers; flowers very light yellow in color, long lasting; petals slightly wavy and tips curled back; flowers 4½ inches across the face and modestly sweet-scented; blooms during the middle of April in Florida."

EVERBLOOMING. In 1935 Mrs. Mary G. Alley, Pine Grove, West Va., sent a daylily by this name to The New York Botanical Garden. The flower is full, clear cadmium yellow and of medium size. Mrs. Alley reports that this plant blooms early in spring but also flowers again in autumn.

FLAVIA. Perry; catalog 1936. "A very distinct break; flowers over 6 in. across, narrow spidery segments, rich golden yellow; July-August; 3 ft."

FLAVINA. Arthur Fewkes. Listed catalog 1934, Fairmount Iris Gardens. A plant from these gardens grown at The New York Botanical Garden is two feet tall; blooms in May; flowers lemon yellow. Not dwarf as first described.

FULVA SPECIOSA. Listed by R. Wallace & Co., in catalog of 1937. Described as "very vigorous, with erect branching flower stems and bright orange-brick flowers. June-August. 4 ft." Evidently a fulvous daylily. In the catalog the name is written *H. fulva speciosa*, as though the type is a botanical variety rather than a seedling propagated as a clone.

GAIETY. Betscher. Listed in 1932 and possibly earlier, catalog of Kenneth McDonald & Sons Ltd., Ottawa, Canada. "Pale yellow. Fragrant. Outstanding."

GARDEN GOLD. Mrs. Frances E. Cleveland, Sunnybrook Iris Gardens, Eatontown, N. J. Listed in 1936 catalog of Fairmount Iris Gardens. Described as: "Selected from many seedlings as being outstanding; clear yellow, 3 ft."

GELASMA. Yeld. Reported to the writer by letter as "like Winsome but three weeks or more later in blooming." Evidently not described or listed for sale.

GIANTESS. Betscher. Mentioned in a recent letter from Mrs. Thomas Nesmith. Not as yet described or listed for sale.

GIANT ORANGE. W. H. Henderson. First listed in 1934 autumn catalog Henderson's Experimental Farms, Fresno, Calif. "Flowers are very large deep orange covered with a gold sheen. Flowers are of a heavy substance and petals very wide. Comparable in width of petals and size to some of the Amaryllis hybrids. Plant is 30 inches in height."

GLOAMING. Paul C. Cook, Bluffton, Indiana. First listed 1936 catalog Fairmount Iris Gardens. "Large open blooms with yellow background, heavily overcast with reddish rose-purple. The whole flower has a brilliant and sparkling beauty that is most pleasing. 3½ ft. July-August."

GLORIANA. Betscher. A plant with this name was first listed in 1936 catalog, R. V. Ashley, Arvista Gardens, Battle Creek, Mich. Described as "New and very rare. A golden yellow of long season. One of largest and finest." A letter from Mr. Ashley in March 1937 indicates that the plant which he has listed as GLORIANA was also sent out by Mr. Betscher under the name DOVER and that a somewhat similar plant which has larger and more deeply colored flowers is to be distributed under the name GLORIANA.

GOLDEN EMPRESS. C. N. Dennett, Amesburg, Mass. First listed in 1936 catalog Fairmount Iris Gardens. "Many golden flowers borne on tall stately stalks; flowers are of good size and firm texture. One of the late blooming varieties. 5 ft. August-September."

GOLDEN-FULVA. Betscher. First listed 1936 catalog Bristol Nurseries, Inc., Bristol, Conn. "Rich orange-yellow with just a trace of the fulva tawniness. Good-sized flowers, freely produced. Height 3 ft. July-August."

HARRIET MOORE. Carl Purdy, Ukiah, Calif. Reported to the writer in letter. Evidently not as yet described or listed for sale.

HELEN CAMPBELL. Perry; catalog 1936. Described as "Bold clumps of attractive foliage from which arise stout blackish-green stems, bearing a profusion of large, well-formed flowers 5 in. across, rich orange-yellow; July-Aug. 4 ft."

HERBERT SPENCER. Mentioned in a recent letter from Mrs. Thomas Nesmith. Obtained by her from Mrs. Franklin B. Mead for trial.

HIGHBOY. Gray & Cole, Ward Hill, Mass. First listed in catalog 1934 as *Hemerocallis* (late); first listed as Highboy in catalog 1936 with statement as follows:—"Highboy, 5 ft. August. We found this plant in our nursery, propagated and named it. It is a pale yellow, the latest and tallest variety we have."

JUNE BOISSIER. Perry; catalog 1934. "Stout branching stems towering well above its broad foliage, bearing many large well-expanded flowers over 6" across, a brilliant shade of rich bronze-orange, with a pale crimson zone and sulphur-yellow base; July-Aug. 3½ ft."

KUNDRED, A. E. A. E. Kundred Inc., Goshen, Ind., 1934 catalog. Described as "A new seedling originated by A. E. Kundred. It is a beauty, the petals being elegantly waved and of the finest lemon yellow color. Flowers open in the evening. It is tall, medium late blooming, strong and vigorous."

LARGE GOLD. Mentioned in 1936 in a letter from R. V. Ashley, who states that he obtained a plant of this clone from Mrs. E. L. Scheffy who described it as "a very fine large flower." Not as yet described or listed for sale.

LEMONETTA. Betscher. Mentioned in a recent letter from Mrs. Thomas Nesmith. Not yet described or listed for sale.

LINDA. Stout. Described and illustrated in *Herbertia* 3: 92, 1936, as follows: "In respect to the ensemble of coloring, the flowers of the LINDA Daylily are somewhat bicolored, pale-fulvous, and eyed. The throat is a shade of yellow approaching apricot yellow with greenish tinges at its base; the sepals are more clearly yellowish with almost no traces of fulvous; the outer half of the petals is delicately overcast with pale fulvous and there is a conspicuous eye zone of Brazil red bisected by a strip of pale fulvous that extends along the midvein toward the throat. The open flowers have a spread of about 4½ or 5 inches, and they are spreading rather than recurving. A well-grown plant usually stands between 3 and 4 feet tall and the scapes are much branched and up-

standing. The season of bloom at New York is in early July. The ancestry of the LINDA Daylily includes the species *Hemerocallis Thunbergii*, *H. citrina* and two different seedlings of *H. flava* which came from the wild in central China."

First listed in 1937 in catalog of Farr Nursery Co.

LOW-GROWING. Burbank. Reported by letter from Frank A. Leach, Jr., Piedmont, Calif., who states that this plant is supposed to be a seedling reared by Luther Burbank about 20 years ago. Not yet described or listed for sale. Possibly same as the BURBANK Daylily.

MADCAP. Nesmith. First listed catalog 1935, Fairmount Iris Gardens. Described as: "A lovely rock garden variety with rosy bronze petals and yellow sepals; much admired by garden visitors. 1 ft. August."

MAGNIFICA. Yeld. Mentioned in 1935 in Journal of Royal Horticultural Society 60: cxxvi. Not yet described or listed for sale.

MARS. Perry; catalog of 1936. "Long trumpet-shape flowers, uniform shade of bright orange, narrow divisions, three inner segments crested; July; 2½ ft."

MARY FLORENCE. Betscher. First offered by Kenwood Iris Gardens, Cincinnati, Ohio, in 1934 list. Plant grown at The New York Botanical Gardens, has clear apricot yellow flowers of medium large size; about three feet tall; blooming in July.

MAY MORN. Nesmith. Fairmount Iris Gardens catalog 1937. "A glowing flower of orange yellow which blooms with the bearded irises. The flowers are medium in size with many blooms on each stalk, giving a mass of color that is most effective with the irises. 2½ ft. May-June."

MAY SADLER. Perry; catalog 1934. "This beautiful introduction is one of the most distinct of my many new varieties; the medium-large flowers are freely produced during July, a brilliant reddish-brown, lined and splashed orange, with orange-yellow throat; only 2 ft. high. July."

MERCIA. Perry; catalog of 1936. "Broad pendant foliage, stout stems terminating with crowded heads of large, flat, tubeless flowers nearly 6" across, rich golden-yellow; a new break in this genus; July; 3 ft."

MIDAS. Stout. First listed by the Farr Nursery Co., August 1935. "June-July; 40." The flowers have a spread of about 5 in.; the segments are pointed at the apex and recurving; the color is a clear, glowing, golden orange with no trace of fulvous. The branched scapes bear as many as fifteen flowers which stand about 18 inches above the upper level of foliage. In the underground parts there is a compact habit of growth. This seedling is a hybrid of the LUTEOLA Daylily x *Hemerocallis aurantiaca*."

MONA. Perry; catalog 1936. "Open stellate flowers, dark lemon-yellow; mid-July; 2½ ft."

MOONLIGHT. Yeld. Reported to the writer in letter and described as "tall; blooms a fortnight after *H. flava* has finished; more stout in the petals than *H. flava*." Not yet listed for sale.

MOONSTONE. Perry; catalog 1932. By omission left out of the volume Daylilies. "A delightful flower of brilliant reddish-buff, with cream zone in cut of flower; very fluted petals; long season of bloom. 3½ ft. June-August."

MULTIFLORA ISIS. Perry; catalog 1936. "Rigid, branching stems bearing a profusion of small flowers, lemon-yellow; passing to rich yellow; seeds freely; July-August; 2½ ft."

MULTIFLORA LUNA. Perry; catalog, 1936. "Rigid, branching stems, medium-sized, bell-shaped flowers, rich yellow, reverse bronze-buff; remarkably free flowering; July-Aug. 2½ ft."

NILBIO. Mentioned in Gartenschöenheit, 14: 12, December 1933. A letter from Willy Müller, Naples, Italy, states that this is one of the fulcitrina hybrids raised by him and first listed in 1908. This plant has large flowers, medium dark fulvous in color with slightly darker eye zone.

OLIF. Origin not definitely known to writer. Catalog 1934, Fairmount Iris Gardens. This is evidently a clone of *H. Middendorffii*. Mrs. Nesmith states in a letter that this clone came from John Lewis Childs, Inc., and that it is being discarded from her gardens as "not much good."

ORANGE KING. Catalog 1934, Fairmount Iris Gardens. Described as: "This is well described by the name it bears. New and rare. 3 ft." Mrs. Nesmith informs the writer that she obtained this plant from John Lewis Childs, Inc., and that she does not have information regarding its origin.

ORIOLE. Nesmith; catalog 1936. "The brilliant orange plumage of the Baltimore oriole is the same color as this new and lovely *Hemerocallis*. Much admired by all garden visitors. July-August."

PALE MOON. Mrs. Frances E. Cleveland, Sunnybrook Iris Garden, Eatontown, N. J., has supplied the following information. She observed at the Lovett Nursery propagations of two different daylilies intermingled with nursery stock of Lovett's Orange Daylily and Lovett's Lemon Daylily and distinct from these. She purchased the stocks and named the darker of the two WOODLOT GOLD and the paler one PALE MOON. Evidently introduced by Mrs. Cleveland in 1934. Described as "large lemon yellow, similar to HYPERION but without greenish cast."

PANDORA. Perry; catalog 1936. "Stout branching stems bearing many loosely built flowers, narrow segments; delightful shade of reddish-brown, faint yellow line running through each segment; July; 2½-3 ft."

PATRICA. Stout. First offered in 1935 catalog of Farr Nursery Co. "Early to late July; 36." This daylily is a sister seedling of the Dauntless daylily and in habit of growth and season of bloom it is much the same; but the flowers are clear and even toned pale yellow, of shade near lemon chrome, with throat greenish at the base. The flowers are medium large, 5" to 7" across, with pronounced fragrance; the petals and sepals overlap and conform in outline to give a very full flower of a firm and waxy texture."

PEACH BLOW. Nesmith; catalog 1936 Fairmount Iris Gardens. "Large open flowers of yellow heavily brushed with deep coral. A yellow and coral-pink combination that is most appealing. 2½ ft."

PERFECTION. Perry; catalog 1936. "Slender much branched stems bearing a profusion of small open flowers, uniform shade of rich golden-yellow; one of the best for border decoration. Late June. 2½ ft."

PINK LUSTRE. Nesmith; catalog 1937. "Exquisite flesh-pink flowers with lustrous sheen. The petals are slightly ruffled and flaring with pale cream mid-rib. The sepals are flaring and slightly lighter in pink tone. The throat of the flower is pale canary yellow. July-Aug. 3 ft."

POLLYANNA. Reported to writer by Mrs. E. L. Scheffy who obtained this plant from Mrs. Thomas Nesmith. Mrs. Nesmith states that this plant is early flowering and has light yellow flowers.

PRINCESS ELIZABETH. Perry; catalog 1936. "Large open flowers 5 inches across, rich bronze-orange, crimson zone, orange base; July; 2½ ft."

RAJAH. Stout. Catalog 1935 Farr Nursery Co. "July-August; 40". The flowers are large and gayly colored with a conspicuous eye zone. The throat is a pale orange with a greenish tinge. The blades are English red, traversed by darker colored veins and there is a conspicuous eye zone, as in Mikado, that is near the shade of garnet brown. The scapes are coarse branched, bearing as many as twenty flowers. The foliage is a good green, rather dark in shade, medium coarse and ascending; spreading to a level about 12 inches below the flowers. In summary, a darker and later Mikado of very robust stature." Illustration in *Journal of The New York Botanical Garden*, 36: 211. 1935.

RALPH SCHREIVE. Reported by Mrs. H. H. Dewey, Schenectady, N. Y., who states that this plant came to her from T. F. Donahue, Newton Lower Falls. Evidently has not been described or listed.

RAYON D'OR. Perry; catalog 1936. "Medium-sized flowers, broad over-lapping divisions, rich orange-yellow stained red, purple tipped buds; July; 2½-3 ft."

RHODOS. Perry; catalog 1936. "Erect, open flowers, reddish-bronze shaded maroon, yellow centre; July; 2½ ft."

ROBIN REDBREAST. Nesmith; catalog 1936. "Cherry-red flowers overcast toward the throat with velvety red-purple. Slender graceful stems with blooms well above the foliage. Very rich and pleasing in color harmony. 3 ft. July-August."

ROSA KELL. Reported to writer in a letter from John Scheepers, Paradou, Brookville, N. Y. Flowers rich orange, much like the GOLDENI Daylily. Not yet listed in catalogs.

SALEM DAYLILY. Listed in catalog 1934, Fairmount Iris Gardens. "A type which is similar to *H. flava*, but flowers a little later. This variety has been blooming at old Salem, Mass., in gardens for more than one hundred years and is a great addition to the early June flowering kinds."

SATURN. Stout. First listed 1934 by the Farr Nursery Co. Illustrated and described in *Journal of The New York Botanical Garden*, March 1937: "The *Saturn* daylily was obtained after several generations of selective hybridizations which involved as parents *Hemerocallis flava*, *H. fulva* clone Europa, a wild plant of *H. fulva* from Japan, and *H. multiflora*. The general habit of the plant is of an erect *H. multiflora*, only more robust and with larger flowers of delicate fulvous colors. At New York the period of blooming has been from about June 15 to July 15. The foliage is nearly dormant in winter. The scapes are much branched and stiffly erect to a height of from 3 to 4 feet. The flowers are numerous, about 3 inches across, widely spreading and full; the throat is apricot-yellow; the petals have an eye zone of vinaceous rufous, beyond which is an area of ochraceous orange, and there is a marginal border of almost clear apricot-yellow. The sepals are somewhat less strongly eyed and they are reddish fulvous on the back. The marginal band of paler color in the open flower is somewhat more noticeable than in other seedlings or named clones which the writer has thus far seen."

SAYDA. Yeld. Reported by letter as "dark orange with a halo around the center of the flower; a softer SIRIUS but quite distinct." Not yet listed for sale.

SEMERAMUS. Reported to the writer by letter from Amos Perry, who states this is not one of his seedlings but does not state origin. Not yet described or listed for sale.

SERENADE. Stout. First mentioned in *Journal of The New York Botanical Garden*, Sept., 1935. "A robust plant with slender bending scapes and flowers of crinkled and wavy petals and delicate and subdued shades of pale yellow and pale fulvous." First offered by Farr Nursery Co., catalog 1937.

SHARON. Cook. A letter from Mr. Cook received in March 1937 states that this seedling was grown by him, and he describes the plant as follows:—"Flowers during late June and first half of July; scapes 30-36 inches; flowers widely open, orange with flush of fulvous." First listed by Fairmount Iris Gardens, catalog spring 1937.

SICA. Reported in a letter from George Yeld in 1934 as "a little darker than HYPERION, is looser in the petals and has a distinct brown flush round the tips of its buds. The seed pods show the same brown tint."

SONNY. Stout. Catalog 1935, Farr Nursery Co. "July-August; 36". Ever since it first bloomed in 1925 this seedling has been considered to be a plant of unusual charm and beauty. The flowers have a spread of four to five inches. The perianth segments are thick and firm in texture and strongly recurving and the petals are somewhat twisted. The throat of the flower is greenish in color and the face is a clear uniform shade of light yellow. On hot sunny days the color gradually becomes paler but the texture remains firm and the surface waxy and the flowers do not wither. The flowers open about sundown and are widely open throughout the next day and well into the following night. During the evening there are two sets of flowers that are open. The foliage forms a loose dome of spreading-ascending leaves extending almost to the flowers. The scapes are still and loosely branched, and they bear as many as fifteen flowers. The SONNY Daylily is a hybrid of the second generation of the cross *Hemerocallis Thunbergii* x *H. aurantiaca*." Illustrated in *Journal of The New York Botanical Garden*, Sept. 1935.

SPRINGTIME. Nesmith; catalog 1935. "A lovely rock garden subject. Clear medium orange with lighter midrib on petals; sepals a tone darker. Beautiful open flower of very smooth finish; petals slightly ruffled. 20". May-June."

STALWART. Cook. Catalog 1935 of Fairmount Iris Gardens. "A beautiful new hybrid of tawny reddish-bronze and orange tones. Large flowers with nicely recurved petals, borne on tall well-branched stems. A very free bloomer and does well in hot dry weather. Excellent in every way. 40 in. July-August."

A full flower with orange fulvous and slight trace of eye zone. Near Cinnabar in color. Mr. Cook states in a letter that this seedling is from Calypso x *H. aurantiaca*.

STARLIGHT. Nesmith; catalog 1936. "Tall well branched stalks bearing many flowers of palest yellow. The blooms are large, and the petals charmingly fluted. The nearest to white in color of any *Hemerocallis* that I have seen. Much admired by visitors to the garden. Very beautiful. 4 ft. July-August."

STAR OF GOLD. H. P. Sass, Midwest Gardens, Washington, Neb. Catalog 1934, Fairmount Iris Gardens. "Beautiful waxy flowers of palest yellow; large and star-like in form; the best of the delicate yellow *Hemerocallis*. 4 ft. July-August."



Max Hoeber, Bonn, Germany

See page 187

Hybrid amaryllis, H. aulicum X H. vittatum
First generation



T. A. Weston

See page 188

Hybrid amaryllid—Probably Vallota-Cyrtanthus cross

Plate 67

SUMMER EVE. Nesmith; catalog 1934. "Cupped-shaped flowers of pinky-orange, which toward night change to peach-pink apricot, giving the effect of two different blooms on one plant. Greatly admired by garden visitors. 3 ft. July-August."

SUMMER MULTIFLORA HYBRIDS. Stout. First listed by the Farr Nursery Co., 1935. "July-August; 30. Multiflora Daylilies have the distinct and desirable characteristics of (a) long bloom period, (b) numerous flowers to a scape, (c) small to miniature blooms which are very effective in either mass or cut flowers display. The species is native to China and of recent importation by Dr. Stout for breeding purposes. Several striking developments have already resulted with BIJOU as the forerunner. Among the clear colors, a group of about fifty sister seedlings were found to be so identical, as well as distinct and desirable, that it was decided to propagate and introduce them as a group. The clear orange blooms are two to three inches across and scapes bear up to 50 blooms, successively, thruout mid-summer."

SUNBEAM. Fewkes. Reported in 1934 by letter from Mrs. Thomas Nesmith as a "dwarf variety." Evidently not yet described or listed for sale.

SUNGOLD. H. A. Dreer Inc. First listed in wholesale catalog 1937. Brief description supplied as follows:—"June 10; medium height; flowers 5 to 6 inches in diameter, deep gold, with broad petals."

SYLPHIDE. Perry; catalog 1936. "Slender stems terminating with crowded heads of medium-sized flowers, delicate shade of silvery-rose, nankeen centre; July; 2½ ft."

TODMORDEN. First listed in catalog Hildemer Gardens, Wawa, Pa., in 1934. Information supplied by Miss Hannah S. Pennell as follows: "This daylily was observed growing among others by Mrs. Arthur H. Scott, Todmorden Farm, Maylan, Pa., some ten years ago. The plant usually blooms throughout June into July with scattering bloom again in fall. Many flower stalks reach a height of 42 inches. The general color effect of the flower is clear rich orange. The individual flower has a spread of five inches and is delightfully fragrant."

VIESSEAUX, MRS. Perry; catalog 1936. "Slender stems terminating with crowded heads of small flowers, silver-apricot shaded silver grey, bold yellow line running through inner segments, faint yellow zone; new shade to this interesting genus; July; 2 ft."

WOLOF. Stout. First described and illustrated in *Herbertia* 3: 95 and 113, 1936. "The WOLOF Daylily has flowers of dark brownish-red-fulvous coloring, the stature of the plant is robust (from 3 to 4 feet), and the season of bloom at New York is in July. A more precise designation of the flower coloring according to Ridgway's "Color Standards and Nomenclature" is as follows: The throat is clear orange near the shade of light cadmium; the sepals are between Morocco red and garnet brown without either a mid-zone or a central stripe; the petals have a

mid-zone near garnet brown or maroon, which is somewhat darker than the sepals; the blade outside this zone is near Morocco red with darker veins; the stripe that extends through each petal tapers and is not sharply defined along its margins. The back of both the sepals and the petals is somewhat tinged with red. The general color effect is noticeably different from that of Theron and Vulcan, which are also of the dark red class, and all of these are much darker than Rajah. The flower is medium full, medium large (from 4 to 5 inches in spread), the petals and sepals are broadly recurving, and the form and color is well maintained during the day. The somewhat robust foliage and the erect, much branched scapes give a good habit of growth and the plant is fully hardy at New York.

This daylily has in its ancestry the species *Hemerocallis Thunbergii*, *H. aurantiaca*, and a certain plant of *H. fulva* from the wild and it was obtained after several generations of selective breeding. The name Wolof refers to a native tribe in Africa and is here applied to suggest that the plant in question is one of the dark-colored type of daylily."

First offered in special blue list by Farr Nursery Co., spring 1937.

WONDER GOLD. Betscher. Reported in 1937 by letter from Mrs. H. H. Dewey who described this clone as having "large wide open flowers."

WOODLOT GOLD. See notes on the Pale Moon Daylily. Evidently first listed by Sunnybrook Iris Garden in 1934. Described as "very large, soft cadmium yellow."

YELLOW WONDER. Reported to be a seedling grown by A. E. Kunderd, Inc. Evidently not yet described or listed.

ZARA. Perry; catalog 1936. "A beautiful variety of *H. Forrestii*; grass-like foliage, slender stems bearing several well-formed open flowers, delightful shade of rich orange; July-August; 12 in."

The New York Botanical Garden maintains a public display garden for daylilies and efforts are made to obtain a plant of each newly named clone for this garden. These are obtained by donations and are not propagated either for sale or distribution. Many of the clones listed above are in this display garden but mostly they have either not yet bloomed or the plants have not reached a size that admits of adequate description. *In this list, however, the writer does not attempt to evaluate these plants or to pass judgment on the statements quoted from catalogs.*

May 18, 1937.

NARCISSUS

NEW PURE WHITE GIANT LEEDSII NARCISSUS—MARY BEIRNE (V.TUB.)
BEIRNE, MISS M., 1937

We are fortunate to have the opportunity of reproducing in this issue of *Herbertia*, Plate 56, a likeness of the new pure white Giant Leedsii narcissus—*Mary Beirne*, which is briefly described as follows,—“A pure white Giant Leedsii of great individuality and distinction. There is unusual clarity and chaste beauty in the exquisite whiteness of a broad overlapping perianth, and a delicately fluted spreading cup of rare refinement.”
—H. P. T.

SPECIES AND VARIETIES TO WHICH AWARDS WERE MADE
IN 1937

First class certificates were awarded to the following during 1937. The awards are based in practically all cases on observations made in the Society's Trial Collection.

Crinodonna (Amarcrinum) Howardii	Hybrid Hemerocallis, <i>George Yeld</i>
Hybrid Crinum, <i>Ellen Bosanquet</i>	Hybrid Hemerocallis, <i>Dauntless</i>
Hybrid Crinum, <i>Peachblow</i>	Hybrid Hemerocallis, <i>Soudan</i>
Hybrid Crinum, <i>Mrs. James Hendry</i>	Hybrid Hemerocallis, <i>Mikado</i>
Hybrid Crinum, <i>J. C. Harvey</i>	Hybrid Hemerocallis, <i>Waubun</i>
Hybrid Crinum, <i>Sophia Nehrling</i>	Hybrid Hemerocallis, <i>Vulcan</i>
Hybrid Crinum, <i>Virginia Lee</i>	Hybrid Hemerocallis, <i>J. A. Crawford</i>
Hybrid Crinum, <i>Powellii Krelagei</i>	<i>Habranthus cardinalis</i>
Hybrid Hippeastrum, <i>Garfieldii</i>	<i>H. robustus</i>
Hybrid Hippeastrum, <i>August Koch</i>	<i>Zephyranthes citrina</i>
Hybrid Ismene, <i>Sulphur Queen</i>	<i>Z. rosea</i>
<i>Hymenocallis tenuiflora</i>	<i>Z. tubispatha</i>
<i>Cyrtanthus lutescens</i>	<i>Z. macrosiphon</i>
<i>Lecocoryne ixioides odorata</i>	Hybrid <i>Zephyranthes</i> , <i>Ajax</i>
<i>Hemerocallis fulva rosea</i>	<i>Argyropsis candida</i>

(Continued from page 129)

bulb, some of them have leaves deeply channeled, others only slightly so and flattened at the bases. Some of the bulbs are thick and globose and one species has a cylindrical, very long-necked bulb with light-green leaves, narrowly linear at the base and the lower portion, broadens out in the upper third, so that the leaf is almost spatulate. There is also variation in the size of the plants—*H. coronaria* is the largest I have so far collected, with leaves over two feet long, while another species has leaves a foot long or less, very narrow, dark green and usually only two, occasionally three leaves, to the bulb.

Hymenocallis occidentalis seems to always grow with its feet in the water and its head in the sun. *H. palmeri*, in several respects, is in a class by itself. It grows in low, damp, open flats, in company with low

(Continued on page 221)



Pierre S. du Pont

See page 187

Hybrid Amaryllis in the collection of Pierre S. du Pont
Plate 68

4. CYTOLOGY, GENETICS AND BREEDING

A REVIEW OF CHROMOSOME NUMBERS IN THE HEMEROCALLIDEAE, ALSTROEMERIALES, AND AMARYLLIDALES¹

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Texas Agricultural Experiment Station

The taxonomic grouping of plants according to their phylogenetic relationships rests on their evolutionary development, which in turn has a cytogenetic basis. The evidence used by taxonomists is largely morphological and is supplemented by a knowledge of geographic distribution. Evidence from a study of the chromosomes—their number, size, shape, and behavior is just beginning to be utilized in classification. Their role in determining heritable characters and in limiting evolutionary changes suggests the desirability of such studies in supplementing the usual methods. A knowledge of chromosome numbers and behavior may also be of use to the plant breeders, particularly in wide crosses.

The three groups under consideration total about 95 genera with over 700 species in addition to a number of botanical and horticultural varieties. Chromosome studies in about 240 species or botanical varieties from 28 genera have been reported. If horticultural varieties such as those in the genus *Narcissus* be included, the number of forms investigated cytologically is over 300. Because of the mass of available material, this review will be confined largely to listing the chromosome counts together with the literature sources.

Table 1 presents these data in some detail. The different forms are arranged in the first column according to Hutchinson's plan (39). Following this is given the n number of chromosomes (i.e. the number that occurs in each pollen mother cell during the development of the pollen); then the $2n$ number of chromosomes (i.e. the number that occurs in each somatic or body cell of the plant); and finally reference by number to the paper reporting the investigation. These correspond to the numbers under "Literature Cited."

This table was compiled for the most part from the chromosome number lists of Gaiser (25-28), and of Tischler (133, 134), and where possible from the original papers of the various workers. The authors are much indebted to Doctors T. W. Whitaker and Lula O. Gaiser for the loan of reprints and also to Dr. Gaiser for the supplying of much information not otherwise available to them. The table was nearing completion when Suto's papers (120) listing reported chromosome numbers in the Liliaceae and Amaryllidaceae were received. While there is much overlapping between our list and his, it seems advisable to make all of the material available in this publication.

If the n number of chromosomes is composed of a group, each one of which is different from every other in the nucleus, the set is said to

¹ Contribution No. 395, to the Technical Series, Texas Agricultural Experiment Station; approved by the Director, April 27, 1937.

represent the basic (x) number of chromosomes. Plants or species with two such sets ($2x$), one from the egg, the other from the pollen are called diploids. Others may have several such sets ($3x$ —triploid, $4x$ —tetraploid, $5x$ —pentaploid, and so on). Such numbers, multiples of some basic number, are frequently found among the different species of a large genus. Most species, particularly those reproducing largely by seed have a balanced number of chromosome sets ($2x$, $4x$, $6x$, or $8x$). Thus species may have the same basic chromosome number because of a common origin. Such considerations taken in conjunction with a study of chromosome size and shape are a help in tracing phylogenetic relationships.

Table 2 summarizes the information presented in Table 1. It will be noted that more than one basic chromosome number is sometimes suggested for a single genus. Ordinarily the lower number is considered basic and the higher number a later derivative, although both may give rise to a polyploid series. For example 7 and 10 are listed as basic numbers for *Narcissus*. A possible explanation is that a $3x$ (triploid) plant having 21 chromosomes gave rise to a plant with 20 chromosomes, which through mutation or otherwise was able to establish itself to give a new x number of 10. Through continued point mutation or other chromosomal change over an evolutionary period the three extra chromosomes duplicating three of the original set might become sufficiently different to give a new basic set, of 10, in the original sense.

This genus (*Narcissus*) has been the subject of more cytological work than any other in the Amaryllidaceae. Three men, de Mol (70, 71, 73, 74), Fernandes (17-24), and Nagao (80-84) have each made outstanding contributions here. The somatic numbers reported for the genus are 14, 15, 16, 17, 20, 21, 22, 24, 25, 26, 28, 30, 32, 35, and 42. While these form a meaningless string of numbers as just arranged, they can be grouped according to the two basic numbers of the genus—14, 21, 28, 35, and 42 being multiples of 7, while 20 and 30 are multiples of 10. The rest presumably have chromosomal complements similar to one of these plus one or more additional chromosomes obtained through duplication, hybridization or fragmentation.

Fernandes in his monograph (24) has revised the previous classifications offered by various workers for the genus *Narcissus*. In this new classification the taxonomic placement according to subgenera and subgeneric sections coincides in general with the cytological relationships suggested not only by the basic numbers but also by external chromosome structure. It should be explained that in our table the chromosome numbers of several species of *Narcissus* have been changed as reported in one of his papers (22). This was done because of penciled notations on the margins of the reprint as received from this author.

In *Hemerocallis* the basic chromosome number is evidently 11. As Stout (112) points out *Hemerocallis*, with respect to this basic number, is an anomaly in the Liliaceae, the number occurring only in this genus. Its companion, *Hosta*, in the tribe Hemerocallideae has a basic number of 30. From this standpoint *Hemerocallis* would seem to be nearer a number of genera of the Amaryllidaceae. A further careful taxonomic

study coupled with a comparison of chromosome morphology of this genus and possibly *Nerine*, *Clivia*, and *Lycoris* might indicate a shift to the Amaryllidaceae. This case is mentioned as an instance where cytological findings may suggest problems for taxonomists working with these same plants.

Allium supplies the greatest number of species names investigated cytologically of any genus included. Levan (54-60) and others have shown that the basic numbers for the genus are 7, 8, and possibly 9. Since the number of species having 9 as a probable x number of chromosomes is relatively small, it is possible that they may have appeared later in the development of the genus.

The positions of *Brevoortia*, *Hymenocallis*, and *Eucharis* need further investigation. Each is here represented by a single species, and in each case the number is out of harmony with other genera of the Amaryllidaceae. *Hymenocallis* includes around 30 species. It is quite possible that the cytological investigation of other species would bring this genus into general agreement.

The value of a knowledge of chromosome numbers to the plant breeder lies largely in the relation of chromosome behavior to fertility, in the reduplication of genes through polyploidy, and in the chance of gene linkage. In regard to fertility, related species with the same chromosome numbers are more apt to be interfertile than species with different numbers. Forms with unbalanced chromosome numbers ($3x$, $5x$, $7x$, $2x + 1$, $4x + 1$ etc.) are more apt to be sterile or nearly so than those with balanced numbers. Such unbalanced types frequently result from hybridizing, as in crossing plants with $2x$ and $4x$ chromosome numbers to give a triploid ($3x$) plant, or by self pollinating a triploid. Interspecific crosses between parents with different chromosome numbers are more apt to be successful if the species with the higher chromosome number is used as the seed parent than is the case of the reciprocal cross (Thompson, 130). In cases where the sterility of a first generation is due to chromosomal incompatibility, techniques have been developed to double the chromosome numbers to give what is known as an amphidiploid, that is one having two sets of chromosomes from each parent. These usually have a nearly normal fertility. This same technique can be used to effect chromosome doubling of fertile plants to increase their size. The work of de Mol (72, 75) with hyacinths, tulips, and to a lesser extent with Narcissi has shown that the enormous size increase in Dutch bulbous plants is apparently due to such artificially induced polyploidy.

A further use of cytology to the taxonomist and plant breeder lies in the detection of interspecific hybrids. Five forms of *Narcissus* which have been described as distinct species have been found by cytological investigation to be interspecific hybrids. These are: *N. odoratus* L., *N. intermedius* Lois., *N. biflorus* Curt., *N. incomparabilis* Mill., and *N. gracilis* Sabine (Table 1). Genera in which natural interspecific hybridization is common have been found to be very difficult from the taxonomic standpoint.

Perhaps, in conclusion, a word of caution, not to expect too much of a practical nature from cytological investigations, is desirable. The main source of inspiration for work in this field is still the hope of increasing our knowledge of pure science. Chromosomes are highly complicated organs with a great deal still unknown about them. To the horticulturist, information concerning the chromosomes of some favorite is an added item of interest, to the plant breeder, a tool for the further advancement of his work, and to the taxonomist, a substantial aid in establishing satisfactory relationships among the various forms.

TABLE 1.
REPORTED CHROMOSOME NUMBERS IN THE HEMEROCALLIDEAE,
ALSTROEMERIALES AND AMARYLLIDALES.

(Arranged according to the system of Dr. J. Hutchinson)

Form	n	2n	Literature reference
LILIALES			
LILIACEAE			
HEMEROCALLIDEAE			
<i>Hosta</i> ^{1,2} <i>atropurpurea</i>		60	97
<i>H. clausa</i> Nakai	ca.30 ^{III}	90	146
<i>H. coerulea</i>	30		8, 139
<i>H. Fortuni</i> var. <i>gigantea</i>			
Bailey	30	60	146
<i>H. japonica</i>	30		1, 2, 63
<i>H. japonica</i> var. <i>augustifolia</i>	30		1, 2
<i>H. lancifolia</i> Engler		60	63
<i>H. lancifolia</i> Stern. var. <i>longi-</i> <i>folia</i> Nakai		60	146
<i>H. lancifolia</i> Stern. f. <i>albomar-</i> <i>ginata</i> Mak.	30	60	146
<i>H. plantaginea</i> Asch.	30	60	146
<i>H. rectifolia</i>	30		1, 2
<i>H. rupifraga</i>	30		1, 2, 102
<i>H. Sieboldiana</i> Hosk.	30	60	61, 1, 2, 146
<i>H. Sieboldiana</i> var. <i>nigrescens</i>	30		1, 2
<i>H. undullata</i> Bailey	30		1, 2, 146
<i>H. undullata</i> green bud variation		60	146
<i>H. undullata</i> f. <i>albomarginata</i>		60	146
<i>H. ventricosa</i>	30	60	146, 102
<i>H. venusta</i> Maek.	30	60	146
<i>H. sp.</i>	30	60	1, 2, 63
<i>H. sp.</i>	30		1, 2
<i>H. sp.</i>	30		1, 2
<i>H. sp.</i>		60	146
<i>Hemerocallis aurantiaca</i> Bak.	11	22	123, 15, 112
<i>H. citrina</i>		24	129
		12	113
<i>H. disticha</i> Donn.	11	22	123
<i>H. disticha</i> var. <i>Kwanso</i> Nakai	11-20	33	123
<i>H. disticha</i>		33	86

¹ *Hosta*, Tratt.=*Funkia*, Spreng.

² Many investigators (115, 117, 118, 67, 122, 62, 40, 97, 102) reported 12 or 24 as the basic chromosome number, while Belling (8) found n=30, Lewitsky (61) 2n=60-62, Whitaker (139) n=30, D. Sato (102) n=30, 2n=60, and Akemine (1) observed a 30 basic number to be correct throughout the genus of *Hosta* investigated.

Form	n	2n	Literature reference
H. Dumortierii	11		63
		22	112
H. Elmusae	11		15
H. flava L.	11	22	123, 15, 112, 143
H. fulva L.	ca.12		115
	12		129
	11	22	7, 123, 112, 15
	16		132
	18		45
	24		105
	11 ^{III}	33	7, 112
	11-20	33	123
H. fulva clon. 'Europa'	6	12	123
H. fulva. var. flora-pleno	16		106
H. Forrestii		22	112
H. hippeastrioides		22	15
H. Kwanso	11 ^{III}	33	123
H. longituba Miq.	11	22	106
H. Middendorffii Trautv. et Mey.	11	22	106, 15, 97
H. minor Mill.	11	22	106
H. multiflora		22	112
H. nana		22	112
H. plicata		22	112
H. Thunbergii		22	112
H. vermusae	11	22	15
H. sp.		22	106
H. sp.	11 ^{III}	33	106
H. sp.		22	15

ALSTROEMERIALES

ALSTROEMERIACEAE

Alstroemeria aurantiaca	8	16	140
A. brasiliensis Spreng.	8		126
A. brasiliensis	8	16	140
A. chilensis Lood.	8		115
A. haemantha	8	16	140
A. pelegrina L.	8		31
A. psittacina	8		32, 33
A. psittacina (= A. pulchella)	9		108
A. pulchella	8	16	140
Alstroemeria (?)	8		116
Bomarea Caldasiana	9		108, 140
B. Banksii (B. Caldasiana x B. patacocensis)	9	18	140
B. cantabrigiensis (B. Caldasiana x B. edulis)	9	18	140
B. Matthewsii (B. Carderi x B. edulis)	9	18	140
B. Whittonii (B. edulis x B. Carderi)	9	18	140

AMARYLLIDALES

AMARYLLIDACEAE

AGAPANTHEAE

Agapanthus excelsa	15		63
A. umbellatus	15		9, 16, 63
Tulbaghia violacea	6-8		110

Form	n	2n	Literature reference
ALLIEAE			
Allium albidium		16	55
A. albopilosum		16	55
A. aletianum		16	91
A. Allegheniense	7	14	56
A. alpinum	8		50
A. amblyophyllum	8	16	55, 60, 91
A. ammophilum	8		55, 60
A. amplexans	12-14		55
A. angulosum	8		55, 60
A. arinatum		24	91
A. ascalonicum	8	16	36, 55
A. atroviolaceum		16	55
A. azureum	8	16	55, 60
A. Bakeri		16	46, 47
A. baicalense	8		36
A. carinatum	8 ^{III}	24	55
A. Cepa	8	16	87, 67, 96, 125, 55, 60, 51, 91, 52, 103, *
	10 ^{IV}		78
	16		69
		30±	64
		24	10
A. Cepa L.		16	104, 37, 126
A. cernua	7		60
A. cernuum Roth.	8		77
A. ciliare		32	91
A. coeruleum		32	55
		16	88
A. Farreri	7		60
A. fistulosum	8	16	43, 46, 55, 56, 58, 91, *
A. fistulosum var. caespitosum		16	36, 91
A. fistulosum var. viviparum		16	91
A. flavescens		16	55
A. flavum	8		54, 55, 60
A. Forminii		16	55
A. Heldreichii	8		60
A. hymenorhizum	8	16	55, 60
A. karataviense Reg.	8		54
	9		127, 55, 60
A. latissimum	16	32	36, 97, 63
A. Ledebourianum	8		36, 55
A. lepidum var. Rehamanni		16	55
A. lepitans		16	55
A. leucanthum		16	55
A. macranthum		28	55, 56, 59, 60
A. middendorffianum	16		36
A. Moly L.	7	14	67, 68, 54, 55, 56, 99, 91
A. montanum	8		127
A. narcissiflorum	7		55, 56, 60
	8		36
A. neapolitanum	7		60
		28	55
A. nigrum	8		65, 66
A. nipponicum	8	16	46, 47, 91
		32	78

Form	n	2n	Literature reference
A. nutans ¹	8	16	55
	8 ^{III}	24	55
		32	55
	8 ^{VI}	48	55
		64	55
A. obliquum	8	16	55, 60, 29
A. odorum	8	16	34, 46, 47, 60 *
	16	32	68, 69, 60 *
A. "cf. odorum"	12		65
A. oleraceum	8 ^{IV}	32	55, 58
A. ophioscorodon Don.	14-16	ca.32	69
		40	91
A. Ostrowskianum Reg.	8		55, 60
A. pallyssium		16	91
A. paniculatum	ca.8		69, 55, 60
A. pendulinum	7		60
	9		60
A. ponticum		16	55
A. porrum	8 ^{IV}	32	55
A. proliferum		16	91
A. pulchellum Don.	8	16	54, 60, 91
A. pyrenaicum		16	91
R. Rosenbachianum	8		60
A. roseum	8		127
	16		55, 12
A. roseum var. bulbilliferum		32	56
	24		65
A. rotundatum	8		138
	8 ^{IV}		55
A. rubellum		16	55
A. rubens		34	91
A. sativum	8	16	135, 46, 55, 95, 91
A. sativum var. ophioscardon	ca.16		69
A. saxatile	8	16	54, 55, 60
A. Schoenoprasum	8	16	54, 55, 91
	8 ^{III}	24	60
A. Schoenoprasum var. sibericum	8 ^{IV}		55, 60
A. Schoenoprasum var. typicum		16	91, 63
A. Schoenoprasum var. viviparum		16	46, 97, 91
A. Scorodoprasum	8	16	46, 47, 138, 55, 60
A. senescens		32	91
A. sikkinensis		32	55
A. sphaerocephalum L.	8		54, 55, 60
A. splendens		32	97
A. stellatum	7		3
A. stellerianum	8		36
A. stipitatum	8	16	60, 98
A. striatum		18	91
A. subtilissimum Ledeb.	8		54
A. Suworowi	8		56, 60
A. tataricum	14-16		55
A. Thunbergii		16	91
A. torquetrum	8		127

¹ According to Levan (1931), **A. nutans** consists not only of euploid forms with 8 basic chromosomes but also of aneuploid forms which constitute 2n=42 and 68, and it was found by him that pollen grains with varying number of chromosomes occur in both polyploid and aneuploid forms.

Form	n	2n	Literature reference
<i>A. tricoccum</i>	8		90
<i>A. triquetrum</i>	9		56
<i>A. ursinum</i> L.	8		31
<i>A. ursinum</i>	7	14	13, 14, 55, 56
<i>A. validum</i>	14		55, 56
<i>A. Victorialis</i> L.	8		67, 55, 60
<i>A. Victoriale</i>	16		36
	8		55
<i>A. Victoriale</i> var. <i>asiatic</i>		32	97
<i>A. vineale</i>		32	55, 91
<i>A. yunnanense</i> Diels	8	16	55, 60
<i>A. zebdanense</i>	8		138
	9		60
<i>A. sp.</i>	8		32
<i>Nothoscordum bivalve</i>	9	18	49, 3, 5, 6
<i>N. fragrans</i> Kunth.	8		49
<i>N. fragrans</i>	12		66
	8 ^{IV}		63
	9	18	109, 60
<i>N. striatum</i>		16	66
<i>Brodiaea californica</i>			
(= <i>Hookera californica</i>)		10	44
<i>B. stellaris</i> (= <i>H. stellaris</i>)		12	44
<i>B. minor</i> (= <i>H. minor</i>)		14	44
<i>B. coronaria</i> (= <i>H. coronaria</i>)	21	42	44
<i>B. "californica"</i>			
(= <i>Dichelostemma californicum</i>)		36	44
<i>B. multiflora</i> (= <i>D. multiflorum</i>)		30	44
<i>B. pulchella</i> (= <i>D. pulchellum</i>)		36	44
<i>B. capitata</i> (= <i>D. capitatum</i>)		72	44
<i>B. uniflora</i>		12	144
<i>B. grandiflora</i>		36	144
<i>B. lactea</i>	21-24		107
<i>B. sp. (Triteleia)</i>		10-12	79
<i>Brevoortia ida-maja</i>	ca. 20		44
GALANTHEAE			
<i>Galanthus cilicicus</i>		24	35
<i>G. Elwesii</i>		24	35
<i>G. Elwesii robustus</i>		24	35
<i>G. Elwesii praecox</i>		24	35
<i>G. nivalis</i>	12		108, 137, 94 *
		24	35
<i>G. nivalis</i> L.	10		137
<i>Leucojum aestivum</i>		20-24	35
	11	22	85, 53
<i>L. autumnale</i>		14	35
<i>L. pulchellum</i>		20-24	35
<i>L. vernal</i>	12	24	92
		20	35
AMARYLLIDEAE			
<i>Amaryllis belladonna</i> L.		20	19
<i>Nerine Bowdeni</i>		22	131
<i>N. curvifolia</i>		22- (24)	35

Form	n	2n	Literature reference
N. pusilla		ca.24	35
N. rosea Herb.		22	79
N. sarniensis		22— (24)	35
N. undulata		22	35
CRINEAE			
Crinum asiaticum L. var. japonicum BAK		22	85, 63
C. latifolium	ca.12		108
	12		136
C. maritimum		18	119
Cyrtanthus parviflorus		ca.16	125
Vallota purpurea		16	131
Ungernia Severzovii B. Fedtsch		24	4
ZEPHYRANTHEAE			
Zephyranthes candida		36	38, 145
	19	38	85
Z. carinata		46	85
Z. Lindleyana Herb.		48	18, 20
Z. texana	12	24	93
Sternbergia lutea Roem. et. Schult.		12	144, 145
HAEMANTHEAE			
Olivia miniata		18	11
C. miniata		22	131
Haemanthus sp.		16—18	79
H. albiflorus		16	35
H. Catherinae		16	35
H. coccineus var. coarctatus		(14)—16	35
H. fimbriatus		16—(18)	35
H. Katharinae	ca.12		108
	9	18	141
H. Katharinae Bak.	8		142
H. multiflorus		16—(18)	35
H. pubescens var. hirsutus		(14)—16	35
EUCHARIDEAE			
Pancratium ceylanicum		90—100	35
P. maritimum L.		18 or 20	19
P. maritimum L.	11	22	23
P. speciosum		ca.90	35
Hymenocallis rotata	40		85
Eucharis Amazonica	ca.45		108
HIPPEASTREAE			
Hippeastrum japonicum		(22)—24	35
H. rutilum fulgidum		(22)—24	35
H. vittatum		46	85
Lycoris albiflora		16, 17, (18)	42
L. aurea		12	42
L. radiata		33	42
L. radiata Herb.	11 _{III}	33	89
L. sanguinea Maxim.	11	22	89, 42
L. squamigera		27	124, 42

Form	n	2n	Literature reference
NARCISSEAE			
<i>Narcissus Barri</i> (or <i>Leedsii</i>) (a variety)		14	84
<i>N. biflorus</i> Curt. (= <i>N. poeticus</i> x <i>N. tazetta</i>)			
<i>N. biflorus</i> (<i>N. poeticus</i> gigas x <i>N. tazetta</i>)		24	111
<i>N. biflorus</i> (a variety)	7 _{II} + 10 _I		84
<i>N. biflorus</i> var. "Elvira"		24	84
<i>N. biflorus</i> Curt.		17	24
<i>N. bulbocodium</i>		42	35
<i>N. bulbocodium</i> var. "Androe- cium of <i>Bulbocodium</i> "		42	80
<i>N. bulbocodium</i> var. "Common Hooped Petticoat" (double fl'd)		14	80
<i>N. bulbocodium</i> var. "Conspicuous"		21	80
<i>N. bulbocodium</i> L. var. <i>genuinus</i>		14	17, 21, 22
<i>N. bulbocodium</i> L. var. <i>nivalis</i>		14	17, 21, 22
		15	24
<i>N. bulbocodium</i> L. polyploid forms from diff. localities		26	
		28	24
		35	
		42	
<i>N. bulbocodium</i> x <i>N. reflexus</i>		14	24
<i>N. calcicola</i> Mend.	7	—	18, 22
<i>N. cyclamineus</i> DC.		14	24
<i>N. festalis</i> (races)		14, 20, 21 22, 28	74
<i>N. gaditanus</i> Bss. et Reut. var. <i>minutiflorus</i> WK.	7		21, 22
<i>N. incomparabilis</i> Mill.		14	35
<i>N. incomparabilis</i> var. "Gloria Mundi"	7 _{III}	21	80, 84
<i>N. incomparabilis</i> var. "Nelson Major"	7	14	80, 84
<i>N. incomparabilis</i> var. "Sir Watkin"		21	80, 84
<i>N. incomparabilis</i> var. <i>aurantus</i>		21	84
<i>N. intermedius</i> Lois.		17	84, 24
<i>N. Jonquilla</i> L.	7	14	80, 84
<i>N. Jonquilla</i> L. var. <i>Jonquilloides</i> WK.	7	14	18, 21, 22
<i>N. minor</i> L.		14	18
<i>N. multiflorus</i> "Ideal"		32	35
<i>N. Odorus</i> L.		14	84, 24
	7		22
<i>N. Poetaz</i> var. "Elvira?"		25	80
<i>N. poeticus</i> L.		16	111
<i>N. poeticus ornatus</i>		14 or 16	111
<i>N. poeticus poetarum</i>		14 or 16	111
	7 _{III}	21	80, 81
<i>N. poeticus</i> var. "Albion"		14 or 16	111
	7	14	74
<i>N. poeticus</i> var. "Glory of Lisse"		14 or 16	111
<i>N. poeticus</i> var. "Glorie van Lisse"	7		74



Pierre S. du Pont

See page 187

Hybrid Amaryllis in the collection of Pierre S. du Pont

Plate 69



Wyndham Hayward

See page 188

Hybrid Crinum—Sophia Nehrling

Plate 70

Form	n	2n	Literature reference
N. poeticus x N. Psedonarcissus			
vars. "Lucifer"		14	71
"Lucifer" (bud variation)		ca.28	71
"Fuselier"		14	71
"Fuselier" (bud variation)		28	71
N. Pseudonarcissus L.		14	24
N. Pseudonarcissus minor		14	70
N. Pseudonarcissus minor cyclamineus		14	70
N. Pseudonarcissus nanus		14	70
N. Pseudonarcissus minimus		14	70
N. Pseudonarcissus muticus		14	70
N. Pseudonarcissus capex plenus		14	70
N. Pseudonarcissus Telamonius			
plenus		14	70
	7	14	74
N. Pseudonarcissus Johnstoni			
"Queen of Spain"		20	70
N. Pseudonarcissus Maximus		21	70
N. Pseudonarcissus var. "Bicolor			
Victoria"		22	70
N. Pseudonarcissus var.			
"Buttonhole"		22	70
N. Pseudonarcissus var. "Van			
Waveren's Giant"		28	70
N. Pseudonarcissus var.			
"Albicano"		14	80
N. Pseudonarcissus L. var.			
bicolor L.		28	21, 22, 24
N. Pseudonarcissus var. "Empress"		22	80
N. Pseudonarcissus var.			
"Golden Spur"		21	70
		30	80
N. Pseudonarcissus var.			
"Grandee"	7III + 1I	22	82, 86
N. Pseudonarcissus var. "King			
Alfred"	7IV	28	80, 84
N. Pseudonarcissus var.			
"Olympia"	7IV	28	80, 84
N. Pseudonarcissus var.			
"Victoria"		14	80
N. Pseudonarcissus var.			
"Princeps Maxim"		14	80
N. Pseudonarcissus var.			
"Emperor"	7III	21	84
N. Pseudonarcissus x			
N. poeticus		28	72, 73
		14	73
N. Pseudonarcissus x			
N. cyclamineus		14	24
N. reflexus Brot.		14	21, 22, 24
N. rupicola Duf.	7		22
N. scaberulus Henriq.	7		22
N. tazetta L.	11		22
N. tazetta L. var. A ₂₂			
("albae" type)	10, 11		83
	11	22	84
N. tazetta var. (an "albae" type)		22	80
N. tazetta var. of "albae" type	10, 11		82
N. tazetta var. (a "bicolores"			
type)		20	80

Form	n	2n	Literature reference
N. tazetta L. var. B ₂₀ (bicolores type)	11 10		83 80, 83
N. tazetta L. var. B ₂₁ (bicolores type)	10 _{II} +1 _I	21	83, 84
N. tazetta L. var. B ₃₁ (bicolores type)	10 _{II} +11 _I	31	83, 84
N. tazetta L. var. ("Chinese Sacred Lily")	10 _{III} 7-14	30 30	83 84
N. tazetta L. var. "Franklin"	10	20	83, 84
N. tazetta var. "Luna"	10 _{II} +6 _{II}	ca.32 32	80 83, 84
N. tazetta L. var. "Soleil d'Or"		30	83
N. tazetta L. var. "Yellow Prince"	10 _{III}	30	83, 84
N. tazetta L. var. "L ₂₀ "	10	20	83, 84
N. tazetta L. (Wild growing form)		30	84
N. tazetta var. (albae type)	10 _{II} +7 _{II}	34	114
N. tazetta L. var. Pannizzianus (Parl.)		22	24
N. tazetta L. polyploid forms from diff. localities		21 22 30	 24
N. trianderus L.		14	22

* Additional papers mentioning chromosome numbers incidentally might be cited.

TABLE 2. SUMMARY

Form	No. species studied	Basic chrom. no.	Range (2n)
LILIACEAE			
HEMEROCALLIDEAE			
Hosta	17	30	60, 90
Hemerocallis	20	11 (6)	12, 22, 33
ALSTROEMERIACEAE			
ALSTROEMERIEAE			
Alstroemeria	8	8	16
Bomarea	5	9	18
PETERMANNIACEAE	0	—	—
PHILESIACEAE	0	—	—
AMARYLLIDACEAE			
AGAPANTHEAE			
Agapanthus	2	15	—
Tulbaghia	1	6-8	—

Form	No. species studied	Basic chrom. no.	Range (2n)
GILLIESIEAE			
ALLIEAE			
Allium	98	7, 8, (9)	14, 16, 24, 28, 32, 48, 64
Nothoscordum	3	8, 9	16, 18, 24
Brodiaea	12	5, 6, 7	10, 12, 14, 30, 36, 42, 72
Brevoortia	1	20 (?)	—
GILLIESIEAE	0	—	—
Galanthus	5	12	24
Leucojum	4	7, 11, (12)	14, 20, 22, 24 (?)
AMARYLLIDEAE			
Nerine	6	11 (12)	22, 24 (?)
Amaryllis	1	10	20
CRINEAE			
Crinum	3	(8, 9, 11, 12)	16, 18, 22, 24
Cyrtanthus	1	(8)	
Vallota	1	8	16
Ungernia	1	12	24
ZEPHYRANTHEAE			
Zephyranthes	4	12, 19	24, 36, 38, 46, 48
Sternbergia	1	6	12
HAEMANTHEAE			
Clivia	1	9, 11	18, 22
Haemanthus	8	8, 9, (12)	14 (?), 16, 18, 24, (?)
IXIOLIRIEAE	0	—	—
EUCHARIDEAE			
Pancratium	3	11	22, 90 +
Hymenocallis	1	40*	—
Eucharis	1	45 (?)*	—
EUSTEPHIEAE	0	—	—
HIPPEASTREAE			
Hippeastrum	2	11, 12, (23)	22-46
Lycoris	5	6, 9, 11	12, 18 (?), 22, 27, 33
NARCISSEAE			
Narcissus	22	7, 10	14, 15, 16, 17, 20, 21, 22 24, 25, 26, 28, 30, 31, 32 35, 42

() doubtful.

? exact number uncertain.

* such large n numbers probably do not represent the correct basic, or x number.

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A DAFFODIL MUTATION—NARCISSUS SCHIZOCORONATUS

FRIEDRICH MEYER, *Hamburg, Germany*

During a visit to some of the Dutch bulb nurseries, I became acquainted with a new race of daffodils that is very promising as a garden subject. I shall try to give some preliminary remarks on their heredity, repeating in part my brief report in *New Flora and Silva* (Vol. 8, No. 4, July, 1936).

The mutation was discovered in connection with researches on some genera of Dutch bulbous plants begun by Dr. W. E. de Mol of Amsterdam, some 20 years ago, and continued since 1922 in collaboration with Mr. A. H. Nieuwenhuis, member of the bulb nurseries of Nieuwenhuis Bros., N. V., Lisse, Holland. The mutation consists of a cleft corona in *Narcissus*.

The united corona in *Narcissus* is apparently a phylogenetically young attribute, and species with naturally cleft coronas like *N. viridiflorus* and *N. serotinus* from the Mediterranean region of Europe and Africa may be regarded as old, primitive ones. Thus we may explain the cleft corona of the mutant as a reduction to former type by loss of an acquired character.

The collection of Dr. de Mol already includes several hundred varieties with the mutant character (*N. schizocoronatus*), which all trace back to only one mutation of the old and well known Bicolor variety, *Victoria*. This mutation, named *Buttonhole*, (See Plate 62), was distinguished by a regularly split-in-six corona with reflexed lobes.

Another mutation of the same origin with corona irregularly cleft, named *Semi-Buttonhole*, proved unfit for horticultural breeding work. Its descendants always had irregularly cleft coronas and could not be considered as an acquisition from the gardener's point of view.

The discovery of the mutant narcissus *Buttonhole* was a lucky chance. The new form was not at all perfect for its bulbs had the inclination to split up, and in addition both pollen and ovaries proved nearly fully sterile as in its ancestor, *Victoria*. The latter is known as an aneuploid, a hybrid containing in its body cells a multiplicity of chromosome sets with additional chromosomes. In this case there are 3 sets plus 1 additional ($3n$ plus 1 or 22). Such plants usually are highly sterile.

For some years all attempts to use the mutant in breeding work proved unsuccessful, but finally a single seedling was obtained by crossing narcissus *Buttonhole* with *King Alfred*. This was named *Gigantic Orchidflower*, and it also was subject to bulb-splitting, had a short stem, but was an advance with regard to fertility.

After pollinating the Yellow Trumpet daffodil, *King Alfred*, and the robust Bicolor, *Van Waveren's Giant*, with pollen of *Gigantic Orchidflower*, a remarkably large number of fine seedlings were selected in both the self-colored and bicolored varieties. They differ more or less in color of the perianth as contrasted with the corona-lobes, in the direction of the corona parts, their length and the curling of their edges.

The illustrations, Plate 64, give an idea of this *Schizocoronatus* Trumpet daffodil in front view and in profile.



Howard & Smith

See page 190

Howard & Smith Hybrid Hippeastrum Breeding Stock



H. H. Hume

See pages 196 and 197

Propagation of Zephyranthes; UPPER, Z. atamasco; LOWER, Z. simpsonii

Later another hybrid, named *Vorstin (Princess)*, was secured (see Plate 63). Parts of its corona are alternately cleft and not-cleft, but it is valuable in breeding work on account of its robust constitution.

It should be noted that the more or less reflexed lobes of the cleft corona are laid opposite to the perianth-lobes, not alternate, as might be expected, if they were to be regarded as the next following independent circle of flower organs. This peculiarity is illuminating in connection with the problem of the origin of the corona which was discussed recently by Dr. W. E. de Mol (*The Origin of Double Daffodils*, R. H. S. Daffodil Year-Book, 1934, pp. 38-44.)

Since the cleft corona mutation behaves as a dominant factor in the preliminary trials, it is natural to expect that it could be bred into some of the other divisions of narcissi in addition to the *Incomparabilis* varieties.

The attempt was made in 1925, using narcissus *Confidence*, which was derived from *N. poeticus*, *Glory of Lisse* crossed on *N. pseudo-narcissus*, *King Alfred*, the mother parent. The variety *Confidence* proved exceptionally fertile, unlike other members of this division. Pollen was used from *Gigantic Orchidflower* and also from some of its descendants. This gave rise to a series of very fine seedlings with the split corona and also a shortened corona (See Plate 63).

In my opinion some of the class of *Incomparabilis* Narcissi with cleft coronas appear superior to the Trumpets. There is a more harmonious proportion between the reflexed and crisped corona and the smooth perianth lobes, and the color contrasts are usually pleasing.

Apparently the work will be carried still further and the cleft corona character will be bred into the *Leedsii* and *Barri* divisions.

Daffodil enthusiasts may expect the appearance of this new race in the trade in the not distant future.

NEW DOUBLE HYBRID AMARYLLIS

J. J. McCANN, *Florida*

The strain of double hybrid Amaryllis which is being described in print for the first time was originated by me several years ago at my nursery in Punta Gorda, Florida as the result of a cross between the small double-flowered form of *Hippeastrum equestre*,¹ which is occasionally found in dooryard gardens over the state, and bulbs of ordinary large forms of hybrid amaryllis (*Hippeastrum*).

The double *H. equestre*, is an interesting orange-colored variety, but is not of vigorous constitution under cultivation. It produces no seeds, and is multiplied solely from offsets. Occasionally the blooms produce an abortive stamen or two, with a small amount of pollen. This pollen was used on the hybrid amaryllis.

The double hybrids have appeared in a variety of colors, mostly shades of red. They do not produce seeds, and hence their natural propa-

¹Baker (*Handbook of Amaryllideae*, 1888), states that "**Amaryllis Alberti** Lemaire in *Ill. Hort.* t. 498, is probably a double-flowered form" of **Hippeastrum reginae**. Members of the Society have tentatively classed this double form as a variety of **Hippeastrum equestre**.

gation is usually slow. In a few cases, however, the bulbs will be found to multiply rapidly, so that I have had as many as 19 offsets from a single plant.

After the production of the first double hybrids, I used the pollen of these new doubles in making other crosses on ordinary hybrid amaryllis as the seed parents. The progeny of these later crosses, I regret to say, have not produced as good flowers of the double type as the first series.

I have not tried to make many of these interesting crosses because my facilities are limited, and I have only two city lots to grow the seedlings on. I have lived beyond my allotted time, and will leave some of the future developments of this new strain to others.

The new double hybrids have proved to be more vigorous than the old double *H. equestre*, which is a rather difficult subject under cultivation. The flowers are distinctive and strangely handsome, some of the colorings are very attractive. The bulbs make normal sizes as in the case of the ordinary hybrid amaryllis, and produce vigorous scapes with four blooms in most instances. Except for the doubling, the plants behave almost the same as the normal hybrids.

The illustration (Plate 65) shows a double flower of a bright orange red color. The photograph was taken in March of 1937. The flowers of this plant averaged about six inches in diameter when fully expanded.

AMARYLLIS IN GERMANY¹

MAX LÖBNER, *Bonn, Germany*

Species of *Hippeastrum* with a few exceptions are rare in Germany, and may only be found in botanical gardens. The so-called "amaryllis" of our nurseries are hybrids of *Hippeastrum vittatum*, sometimes with a little blood of *H. psittacinum*. Of those hybrids rather good forms with fine and large flowers can be met with. The plants are not difficult to grow if one allows them a rest period during the summer time when blooming is past.

Rarer than hybrids of *H. vittatum* are those of *H. psittacinum*, called *H. hybridum*. They are prevalent in English nurseries, and they can be seen on the continent in exhibitions in Belgium and Holland. I saw them in excellent condition in the spring flower show at Heemstede near Haarlem in 1935. From Holland a lot of flowers are sent to our German flower markets. The flowers of the hybrids of *H. psittacinum* are of a more open and noble type than those of *H. vittatum*. The former want some more care with regard to watering, and they produce few, if any, bulblets. We must propagate them by seeds as a rule.

H. aulicum var. *robustum*, in Germany commonly called "Amaryllis Tettaui", is one of the evergreen species of the genus. Formerly it has been cultivated quite extensively in Germany, and to-day it may be seen in many private gardens in the Rhineland as a window plant. Its culture is more like that of *Clivia*, and it does not require a rest period after

¹ Translated from the German by Dr. Camillo Schneider, Berlin, Germany.

blooming. Years ago *H. aulicum* was used quite extensively in hybridizing. The old *Amaryllis Ackermannii* and *A. Ackermannii* var. *pulcherrima* are hybrids of *H. aulicum*.

Among the seedlings of *H. vittatum* sometimes one or more may be found showing a marked influence of blood of *H. aulicum*. Such plants have three flowers to the scape—*H. aulicum* always produces only two large flowers. The throat of flowers with *H. aulicum* blood show the significant green with a red ring as shown in Plate 66. Its leaves do not die off entirely as in the hybrids of *vittatum* and *Psittacinum*, but they are half ever-green. The flowering plant therefore has a more pleasing aspect. Like *H. aulicum* it produces many bulblets.

Unfortunately hybrids of *H. aulicum* have so far not been used for breeding purposes in Germany. I do not know if this has been done in the U. S. A.. According to Mendel's laws of heredity it should be possible in the second generation to get an evergreen amaryllis which does not have the irregular flowers of *H. aulicum* with their narrow perianthlobes but with fine regular roundish flowers like those of the *Psittacinum* hybrids. This would be a valuable goal to take aim at. I am trying to realize this ideal but my work is not yet completed.

Here and there in German botanical gardens the species *H. rutilum* and *H. reticulatum* are met with. The last one is more difficult to cultivate. During its resting period in winter it must not be kept too warm, but when in full growth during the summer it requires hot-house conditions. The watering must be done with great care. It too is evergreen, and it should be used, especially in its variety *striatifolium*, for breeding purposes with the evergreen and unpresuming *H. aulicum* to raise evergreen *reticulatum* hybrids of easy culture. In England *H. reticulatum* has already been used successfully for crossing with *Psittacinum* hybrids. The flowers of *H. reticulatum* are a delicate pink, reticulated with a deeper shade. *H. rutilum* is an easy growing and flowering species.

The oldest amaryllis hybrid raised in gardens is of course *H. Johnsonii*, but it is scarcely found to-day in German nurseries. It is only of historical interest being inferior to the modern hybrids of *vittatum* and *psittacinum*. Nevertheless it may be seen in some regions of Germany as a pot plant in the windows of farm-houses.

HYBRID AMARYLLIS IN THE DUPONT COLLECTION

The illustrations, Plates 68 and 69, show snapshots of hybrid amaryllis in the Pierre S. du Pont collection. Plate 68 shows a 10¾ inch diameter flower, semi-double white suffused pink. Plate 69 shows *upper left*, 1934 seedling, orange and salmon with deep salmon throat, flower 11" diameter; *upper right*, 1932 seedling, amber suffused orange pink, flower 10¾" diameter; *lower left*, 1934 seedling, clear salmon with dark salmon throat, flower 10¾" diameter; and *lower right*, 1934 seedling, dark red; flower 9½" diameter.

CYRTANTHUS-VALLOTA HYBRID

T. A. WESTON, *New York*

A possible natural hybrid between *Vallota purpurea* and some species of *Cyrtanthus* appeared in 1936 among some bulbs imported from a grower on the Island of Guernsey in the English channel. Flower specimens shown in Plate 67 were submitted to Dr. H. K. Svenson, Curator of the Brooklyn Botanic Garden, Brooklyn, N. Y., and he gave the opinion that the plant was apparently a natural hybrid between *Vallota* and a *Cyrtanthus*, it having some of the botanical characters of both genera.

The bulb died after blooming the second time. There is a record of a hybrid between *Vallota purpurea* and *Cyrtanthus sanguineus*, as mentioned in Bailey's Standard Cyclopaedia of Horticulture. This hybrid is still in cultivation in England, and has been shown at an exhibition of the Royal Horticultural Society.

HYBRID CRINUM SOPHIA NEHRLING

WYNDHAM HAYWARD, *Florida*

The hybrid *Crinum Sophia Nehrling*, which is pictured in this issue of *Herbertia* (Plate 70), apparently the first named variety of hybrid crinum produced by the late Henry Nehrling. It is very similar to Nehrling's last hybrid crinum, *Mrs. James Hendry*, which was illustrated on page 80 of 1936 *Herbertia*.

A brief comparison of the two hybrid crinums mentioned above was given in 1936 *Herbertia* on page 79. The flowers are slightly less full and rounded in the case of *Sophia Nehrling* than in the variety, *Mrs. James Hendry*. Nevertheless the umbel is large, the perfume strong and pleasant, and the general effect is striking and attractive. The color is white with delicate shadings of rose pink toward the outer tips of the petals.

The foliage is distinct, and handsome, practically identical with that of *Mrs. James Hendry*. The bulbs make offsets slowly, and are best propagated by cuttage. The flowers are borne on strong stems a foot and a half or two feet above the leaves, and several flowers open at once on succeeding afternoons, lasting in good condition throughout most of the next day, which is unusual in crinums. There are approximately ten flowers in the average umbel. The individual blooms may be five or six inches across the face when widely open. The possible parentage of this hybrid is not easy to guess.

THE HOWARD AND SMITH HYBRID AMARYLLIS STRAIN

FRED H. HOWARD, *California*

Our firm took up the culture of hybrid Hippeastrums some forty odd years ago. Our interest in their culture was brought about by seeding a very fine collection for that period, grown on a considerable scale by an old French nurseryman of this section, Mr. George Compere. From him we obtained a few bulbs and by subsequent propagation carried on until a fair stock was produced. The information which I had from Mr. Compere at that particular period was to the effect that the original stock of these bulbs had been imported from France. In general, the flowers were of very large size, but with somewhat narrow petalage, more or less after the form to be noted in the variety *Hippeastrum reticulatum*, which blood I feel certain was preponderant in the strain.

About this same period we imported a large number of bulbs from various European sources, in order to obtain new types and colors. Carefully recorded crosses between the original Compere stock and these imports were made and a definite system of line breeding was carried on for several years.

During the year of 1907 I made a trip to England, the main purpose of which was to attend the International Genetic Conference held in London under the auspices of the Royal Horticultural Society at Vincent Square. One of the principal topics at this meeting was Mendel's law of heredity, resurrected and ably demonstrated by such leading experimentalists as Prof. Bateson, Miss Sander and Mr. Punnett and others of Cambridge University. I spent some time at Cambridge to become conversant with the practical demonstrations made there. The knowledge gained served well in after years.

One interesting bit of plant lore gained at Cambridge was to see the first hybrid Gerbera crosses raised by Mr. Lynch, curator of the Cambridge Botanical Gardens. These crosses were between the original *Gerbera Jamesoni* and one of its South African congeners. These Gerberas subsequently passed into the hands of Messrs. James Veitch and Sons for commercial distribution. I secured stock of these, probably among the first brought to the United States.

During this visit to England I had the pleasure of seeing in full perfection of bloom the magnificent hybrid Hippeastrums raised by Messrs. Ker and Son at Aigburth, a suburb of Liverpool. I also saw the collection of Messrs. James Veitch and Sons of Chelsea and Slough, and those of Mr. William Bull. These, besides several other fine collections, both commercial and private, were at their best. My firm conviction, formulated at that time, was to the effect that Messrs. Ker's strain, nearly all a uniform Leopoldii type, was the outstanding one in all England.

During this trip I made selections from some of the finer collections, purchasing a large number of bulbs, not only from the raisers noted above, but from certain sources in Holland and Belgium, where large collections were becoming a patent fact.

One principle which we have adhered to in all of our hybridizing efforts is to avoid indiscriminate crosses. Roses, for example, are a far more difficult subject than hybrid Hippeastrums to manipulate and grow from the initial stages to the time of flowering. The results we have obtained in many subjects, aside from Hippeastrums, more than justified the correctness of our applied efforts. A part of our breeding stock is shown in the illustration, Plate 71.

We have at the present time a series of crosses between the Hippeastrums and certain related genera which show some very interesting breaks and such as we anticipate will prove acquisitions to this glorious race of bulbous plants. More, however, of these crosses at a later date.

During the past season, through the courtesy of Mr. August Koch of the Chicago Parks, we obtained a few bulbs of Garfieldi hybrids which flowered a few weeks after potting. From all that I can judge, these remarkably beautiful hybrids will prove immensely valuable in the propagation of a graceful new race of these handsome bulbous plants.

We certainly need to break away from the constant inbreeding which has become a routine procedure in Hippeastrum breeding, and I am firmly of the opinion that the day is not far distant when yellows and hitherto unknown shades will be realized. Except by careful line breeding and gaining a fixity of type, the application of Mendel's law does not help to any great extent. The already inherent hybrid character of the hybrid Hippeastrums and the lack of sufficient data as to their true parentage leaves the plant breeder in more or less of a quandary as to how to proceed, unless it be, as stated above, a careful system of line breeding, plus the injection of the blood of new species for the purpose of securing a fresh start, at least to a limited extent.

Although the work prosecuted by our firm in various hybridizing efforts has been applied to many different subjects, there is nothing in the whole category which, in my opinion, offers a greater field of endeavor than that applicable to Hippeastrums and their improvement. I am positive that in the years to come it will be quite possible to have strains of these which will practically cover the twelve months of the year in time of bloom, and looking at the matter from the economic standpoint of view, they will eventually become one of the most important of florist's flowers.

HASTENING BLOOMING OF SEEDLING HYBRID AMARYLLIS (HIPPEASTRUM) BULBS

AUSKER E. HUGHES, *Florida*

A number of amaryllid growers have reported on blooming hybrid Hippeastrums from seeds in two years. A limited number have produced fair sized bulbs which have bloomed within 22 months. Still others are able to obtain blooming size bulbs only after 3 to 4 years from the time of seed planting. Because of the time required to grow hybrid Hippeastrums from seeds, some commercial growers, and also many amateurs, have resorted almost entirely to offsets for increasing their stocks.

The stem cuttage method of propagating amaryllids has gone a long way in reviving interest in this group. The faithful workers who are responsible for this landmark of progress are worthy of our highest regard. No longer does one need to wait and puzzle over the propagation of a prize variety. With this achievement we may well expect greater effort to be put forth in the development of hybrid Hippeastrums so that more bulbs worthy of being subjected to the stem cuttage process may be produced. Recent developments in the storage of pollens have made possible the holding of pollen from the first blooms of the spring flowering season for use in setting seeds upon blooms opening in June and July.

Late flowering bulbs when crossed with early blooming varieties may produce bulbs which flower in mid-spring. In such a case it would not be possible to bloom them the second spring from seeds unless the shortest time reported (22 months) should be reduced by 2 to 3 months, thus bringing the time down to 18 to 19 months. Seeds from plants blooming as late as June can be planted immediately and with proper treatment the seedlings will flower the second spring following the time of pollination. However, many bulbs bloom in late June and July so that the seeds are not mature before August. To plant seeds in August and to have seedlings in flower the second following spring has apparently not met with success.

Once the hybridist has obtained the seeds from certain crosses it is his desire that they be germinated, grown into full sized bulbs and bloomed in the shortest time possible. Differences of three or four months in the collection of the seeds are quite likely to cost the hybridizer a delay of an additional year in obtaining blooms. Such a handicap would be overcome to a great extent were it possible to obtain blooms in 18 to 19 months. The experiment reported briefly here was undertaken at the writer's home in Orlando for the purpose of studying this problem of the amaryllis breeder.

Materials and Methods. The seeds used in this experiment were grown by Dr. Traub at Mira Flores in 1935. The anthers were removed from all the flowers in his collection before the flowers opened and only the pollen of the variety *Marina* (almost pure white, 10½ in. diameter flower) was cold stored and used throughout the season. He proceeded on the theory that the obvious and common colors usually found in the Mead strain are due to the usual practice of breeders who cross varieties with like colors, and that it would be possible to secure more subtle orchidaceous shades by always using one parent of a lighter color in mak-

ing crosses. To test out his theory he used only one light colored pollen parent on all his darker colored varieties.

The seeds were collected in June and July and planted in flats by the writer at his home in Orlando during the latter part of July and the first of August 1935. The soil in the flats was made up of two layers. A two inch layer, consisting of one-third Orlando Fine Sandy Loam, one-third crushed lime rock, and one-third peat, was placed in the bottom, and ample nutrient material, consisting mainly of poultry manure supplemented with commercial fertilizer of the analysis 4-5-5 was incorporated in this layer. Each flat was then watered with a solution containing $\frac{1}{2}$ oz. maganese sulphate, $\frac{1}{2}$ oz. magnesium sulphate, $\frac{1}{4}$ oz. ferrous sulphate, $\frac{1}{4}$ oz. copper sulphate, $\frac{1}{8}$ oz. zinc sulphate, and $\frac{1}{64}$ oz. borax per two gallons of water. A two inch layer of sand and crushed oyster shells containing a small amount of granulated peat was then placed on the surface and the seeds planted in this layer.

All watering was from the surface, regular applications being made as needed to keep the soil thoroughly moist. Good germination (85%) was obtained. Half shade was provided and under these conditions the seedlings developed rapidly. After three months, bulblets of $\frac{1}{2}$ to $\frac{3}{4}$ inches had been produced. They were now ready to be planted directly in the nursery bed, also in half shade.

Two weeks before the time of planting two beds 4 by 8 feet were prepared in the following manner. Ten pounds of crushed oyster shells, 20 pounds of poultry manure, 5 pounds of a 4-5-5 fertilizer, and $\frac{1}{4}$ pound of combined rare elements in the ratio mentioned above, were worked into the first four inches of the soil of each bed.

In close planting of *Hippeastrum* bulbs it is impracticable to cultivate, so it is necessary to work into the soil as much plant food and soil conditioner as is possible before planting. Crushed oyster shells are flat and range in size from $\frac{1}{8}$ to $\frac{1}{2}$ inch in diameter. Ten pounds worked into the first 4 inches of a 32 square foot plot can be counted on to furnish sufficient calcium for the plants and keep the pH of the soil near 7 for a period of years.

Near the middle of November, 250 bulblets were taken at random and planted in the beds, previously prepared and located in half shade. The rows were 7 inches apart and the plants were set approximately 4 inches apart in the row. Regular applications of 2 pounds of a 4-5-5 fertilizer were made every 2 months and 10 pounds of poultry manure every 4 months, to each bed. When natural moisture was not sufficient, the beds were watered from the surface.

Results. Under the conditions outlined above, thrifty growth was obtained. Large bulbs were produced and the first flowers appeared on February 25, 1937. Practically all of the bulbs bloomed within 18 to 19 months from the time of planting of the seeds. Fully one fourth of the lot bloomed twice, while many produced three flower scapes.

The great majority of the seedlings produced flowers with subtle, lighter shades of pink, orange and red, and thus the desirability of crossing lighter colored varieties with darker flowered ones has been experimentally demonstrated. Many of the hybrids are first class and worthy of naming, and some of them have been registered with the Secretary

of the Society. With the general application of this principle in selecting parents for crossing, the complaint which we hear sometimes, and with justice, that amaryllis are too brilliantly colored, will entirely disappear for the varieties produced in this case, especially such varieties as *Lena B. Hughes*, are as delicate and refined as the orchids.

On April 10, 1937, 100 bulbs were taken at random, and were measured as to diameter by means of a caliper. The diameters of these bulbs in inches are given in Table 1, and the percentages of bulbs in the various size ranges are given in Table 2.

TABLE 1.

Showing sizes of bulbs at the end of 19 months from time of sowing seeds.

Bed No.	Row No.	Bulb number and size. (Sizes of bulbs indicated in inches)										Average
		1	2	3	4	5	6	7	8	9	10	
1	1	4.25	4.25	3.50	3.75	3.50	4.00	4.75	3.25	3.50	3.00	3.78
	2	4.75	2.75	3.00	2.50	3.75	4.25	4.00	3.25	3.00	3.50	3.48
	3	4.25	3.75	4.50	4.00	3.50	3.50	3.00	4.50	3.75	3.00	3.78
	4	3.50	3.00	3.50	4.00	3.75	4.00	4.25	3.00	3.50	3.25	3.58
	5	4.25	4.50	4.25	3.00	4.00	3.50	3.00	3.25	3.75	3.50	3.70
2	1	3.00	3.75	4.00	4.00	3.50	2.25	2.00	3.50	3.00	2.50	3.15
	2	4.50	4.75	3.50	3.75	3.25	4.00	3.75	4.00	3.25	4.00	3.93
	3	3.75	3.50	3.00	4.25	3.75	3.75	4.00	3.50	3.00	3.25	3.58
	4	3.00	2.75	3.75	3.50	3.25	3.50	3.75	4.00	3.50	4.00	3.50
	5	3.25	3.50	3.75	3.25	3.00	3.50	3.25	3.00	3.50	3.00	3.30
1 & 2												3.58

TABLE 2.

Showing percentages of total bulbs in the various size ranges.

Size Range in inches	Percentage	Remarks
2½ to 3	6	86% in range of 3 to 4½ in. 94% in range of 3 in. and over.
3 to 3½	28	
3½ to 4	37	
4 to 4½	21	
4½ to 5	8	

The average for all the bulbs is 3½ inches in diameter,¹ and the extreme range is from 2 to 4¾ inches in diameter. It is interesting to note that 86 per cent of the bulbs averaged from 3 to 4½ inches in diameter, and 94 per cent, 3 inches and over.

Conclusions. From the facts presented above, we may conclude that under suitable conditions, hybrid Hippeastrums may be brought to the flowering stage in from 18 to 19 months from the time of seed planting, and that it is possible to produce large sized bulbs at the same time. Such a program may not be economical in ordinary commercial production of amaryllis bulbs, but is intended for consideration only in growing very valuable hybrids to the flowering stage in the shortest possible time.

The desirability of crossing lighter colored varieties on those possessing the common obvious darker color shades has been experimentally demonstrated. By the application of this principle in selecting parents for crossing, progeny can be secured that rival the orchids in delicacy and refinement of color shades.

¹ Mean: 3.58 plus or minus 0.35; coefficient of variability, 13.71.



H. H. Hume

See pages 197 and 198

*Vegetative Propagation of Zephyranthes; UPPER, Z. grandiflora;
LOWER, Z. rosea*

5. PHYSIOLOGY OF REPRODUCTION

PROPAGATION OF ZEPHYRANTHES

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Virtually all *Zephyranthes* now growing in gardens are wild species unmodified and unchanged. The sole exception to this statement, commonly known at this time, is Ajax, a hybrid by Sprenger⁽¹⁾ between *A. candida* and *Z. citrina*. Planting materials of some species still are secured to some extent from their native habitats, but in the main increases are obtained from offsets, from seeds or from both offsets and seeds.

Species in cultivation differ greatly in the freedom with which offset bulbs and seeds are produced. *Z. grandiflora* Lindley (*Z. carinata* Herbert) is a striking example of a species that so far as known produces no seed and under ordinary handling in the garden does not furnish many offsets. For instance, eighteen bulbs of this species planted out and dug up five years later furnished a total of only thirty bulbs. So long ago as 1837 Herbert⁽²⁾ wrote of the behavior of this plant, "I have never seen it make any advance toward the formation of seed, though tried in various aspects and temperatures." Although several reports have come to hand of seed bearing by this species, it has not been possible to verify them and so far as known Herbert's statement is just as true today as it was when he made it. It may be that most of the bulbs of *Z. grandiflora* are direct asexual descendants of those that came out of Mexico in 1824⁽³⁾. To this time it has been increased only and but slowly from naturally formed offsets. *Z. rosea* produces offsets abundantly and seeds sparingly. Counts of seeds in a large number of capsules of this species have given an average of eight seeds each. *Z. citrina* seeds freely but naturally produces very few offsets and at times over long periods none at all. *Argyropsis candida* (*Z. candida*) produces seed well in Kew Gardens and other parts of England, but seldom has been found to do so in Florida. Among species studied under natural native conditions, *Z. Atamasco* forms offsets in large numbers, old clumps, started from a single bulb, often having a dozen in them and one clump has been counted that had twenty-eight apparently all produced in the same way. Mature bulbs of *Z. Treatiae* and *Z. Simpsonii* are seldom accompanied by offsets. All of the species native in Florida, viz., *Z. Atamasco*, *Z. Treatiae*, and *Z. Simpsonii*, produce seeds in considerable amounts and in about the same quantities.

The *Zephyranthes* discussed may be taken to be representative in their seed and offset production of all the species belonging to the group. Some increase rapidly by offsets, others bear seed abundantly, some develop no offsets of consequence, some produce no seed, and still others furnish both seeds and offsets in considerable numbers.

From what has been stated, it will be noted that *Zephyranthes* differ materially in seed and offset bulb production and, while both seeds

and offsets are satisfactory for reproduction, they are not always and in every species dependable sources of increase. For this reason it was decided to determine in how far propagation by bulb cuttings along the lines worked out by Luyten⁽⁴⁾ and Traub⁽⁵⁾ for hybrid *Amaryllis* would afford a satisfactory means of increase.

Five species were used, *Z. Atamasco*, *Z. Treatiae*, and *Z. Simpsonii*, all native in Florida, *Z. grandiflora* from Mexico, and *Z. rosea* from Cuba. Although other species were in hand the numbers were too small to make it possible to carry the work beyond these five. Bulbs in full leaf were used and cuttings made April 20, 23 and 24, 1936, and the results checked June 19, 1936. The time was not sufficient to secure final results, but was sufficient to indicate the value of asexual propagation for the *Zephyranthes* group. Because of the small size of the bulbs it was decided best not to make the pieces very small. All were planted in clean washed sand. Bulbs were *cross cut*, *scooped*, *oblique cut* and made into *halves*, *quarters* and *eighths* except in the case of *Z. Treatiae*, the bulbs of which were so small that it was exceedingly difficult to make parts smaller than *quarters*.

The following statements cover the methods of preparation:

Cross cut. These were cut with deep V-shaped incisions in the bases of the bulbs, with cuts forming a right angled cross.

Scooped. The stem or basal part of the bulb was scooped out partially. With very small bulbs this was difficult to do well.

Halves, Quarters, Eighths, refer to the cutting of the bulbs longitudinally into these portions, the number of parts depending upon the size of the bulbs.

Oblique cut bulbs had about one-half the basal stem cut away with a part of the upper portions.

The results of this work, when checked, were as follows:

Z. Atamasco.

Cross cut. Six bulbs, all well rooted. One has two bulbels, one has one bulbel and one has one bulbel well developed, with a second starting. Three have no bulbels.

Scooped. Four bulbs. Two well rooted, one slightly rooted, the remaining one without roots. One bulb has a small bulbel, no sign of bulbels on the remaining three.

Halves. Four bulbs, eight halves. All well rooted, six have bulbels and the other two show indications of bulbels starting.

Quarters. Two bulbs, eight quarters. All well rooted but without leaves. Seven have very small bulbels, one has no bulbel.

Oblique cut. Four bulbs. All well rooted without leaves and bulbels.

Typical results with **Z. Atamasco** (L) Herb. illustrated in upper half of Plate 72:—

Upper row: #1, cross cut, with one bulbel developed and a second starting from a single quarter. Remainder in row quartered, first one with bulb occupying whole center; #3 and #4 with single bulbel; #5 and #6 with two bulbels.

Second row: Halves. #1, point of bulbel starting from center; #2 and #3 with one bulbel each; #4 with two; #5 with bulbel starting; #6 with one bulbel.

Z. Treatiae.

Cross cut. Five bulbs, all bulbs in good condition, good root development, no multiplication.

Scooped. Four bulbs. Good root development; leaves started on all; no multiplication.

Halved. Five bulbs, ten pieces. Nine started with one bulbel each, the tenth piece still in good condition but without showing growth. Root development on all ten.

Quartered. Three bulbs, twelve pieces. All with root development, only one showing leaf development. Two pieces with two bulbels, eight with one bulbel and two with none. One or more roots on all pieces.

Z. Simpsonii.

Cross cut. Two bulbs, with both leaves and roots. One bulb with a small bulbel, the second bulb with one bulbel and one just starting.

Scooped. Three bulbs, all well rooted with leaves, two with one bulbel each, one with one bulbel and two others starting.

Halves. Two bulbs, four pieces, one lost. The remaining three are well rooted, one with small bulbel, one with well developed bulbel, one with two bulbels.

Quartered. Two bulbs, eight pieces, one lost. Seven remaining are all well rooted. Two have one bulbel each, four have two bulbels each, one has three bulbels.

Eighths. One bulb, eight pieces. All well rooted. Seven have one bulbel each, one has no bulbel but is rooted.

Oblique cut. Two bulbs. Parent bulbs are rooted. The two small pieces cut off are well rooted. Each of the small pieces shows the starting of a bulbel. One of the large pieces has produced two bulbels. The other one has none.

Typical results with **Z. Simpsonii** Chapman, illustrated in lower half of Plate 72:—

Upper row: First four, eighths, with one bulbel each; #5 and #6, quartered: #5 with two bulbels, #6 with three.

Second row: #1 and #2 halves: #1 has one bulbel, #2 has two bulbels. #3 and #4, two pieces, main large part and oblique cut, with two bulbels and oblique piece taken off with one starting.

Z. grandiflora.

Cross cut. Three bulbs. All well rooted with good foliage. No bulbels.

Scooped. Two bulbs, both bulbs with leaves and good roots. One bulb with bulbel.

Halved. Two bulbs, four pieces. One piece with large bulbel; one piece with three small bulbels and leaves; one piece with five bulbels; one piece with two bulbels, one of these bulbels with leaves.

Quartered. Two bulbs, eight pieces. Good roots on all. Two have one bulbel each, three have two bulbels each, one has four bulbels and two have five bulbels.

Eighths. Two bulbs, sixteen pieces, two of which were lost. The remaining fourteen pieces are all well rooted, four with one bulbel each, three with two bulbels each, and seven with three bulbels each. One or more bulbels on thirteen showed leaf growth.

Oblique cuts. Five bulbs, all with good roots and well developed leaves. One large part with one bulbel, one small piece cut off obliquely is well rooted with three bulbels; the other oblique pieces were lost.

Typical results with **Z. grandiflora** Lindley, illustrated in upper half of Plate 73:—

Upper row: Five eighths, #1 one bulbel; #2 two bulbels; #3 two developed and two or three more in process of developing; #4 has one bulbel; #5 has three. Green leaf tips showing on all.

Second row: #1 and #2, quarters; #1 with four bulbels; #2 with three. #3 and #4, halves: #3 with five bulbels, #4 with one.

Z. rosea.

Cross cut. Five bulbs, all well rooted, good leaf growth. One has one small bulbel, two have three small bulbels each, two have no signs of bulbels.

Scooped. Five bulbs, all well rooted, with leaves. None has produced bulbels.

Halved. Five bulbs, ten pieces. Eight well rooted with leaves, two well rooted but no leaves. Four pieces have growth from a part of the original growth point; three have produced two bulbels; one has five small bulbels; two have one small bulbel starting in each.

Quartered. Four bulbs, sixteen pieces, two pieces lost. The remaining fourteen have well rooted bulbels, five with leaves. Two have started growth from original growth point. Eight have one bulbel each, three have two bulbels each, one has three very small bulbels.

Eighths. One bulb, eight pieces, three pieces lost. The remaining five well rooted. Two have one bulbel each, two have two bulbels each, one has three bulbels.

Typical results with *Z. rosea* Lindley, illustrated in lower half of Plate 73:—

Upper row: #1, #2, and #3, halves, with one bulbel each. #4, #5, and #6, quarters, #4 with one, #5 with two. #6 with one.

Second row: #1 cross cut with two bulbels; #2, #3, #4, #5, and #6, eighths, #2 with one bulbel, #3 with two bulbels, #4 with two bulbels, #5 with one bulbel, #6 with one bulbel.

From the foregoing it will be seen that bulbs *cross cut* and *scooped*, in the manner indicated, produced very few bulbels and the methods have no particular value. It may be noted, however, if bulbs are in hand that are not doing well that these two methods will serve an excellent purpose in rejuvenating them. In practically all instances, bulbs so treated produced abundant root systems far in excess of what the bulbs had when they were lifted for use in the experiment. If *cross cut* or *scooped*, placed in sand for sixty days, then carefully lifted and replanted, there is assurance that the bulbs, in most instances, can be greatly improved in their growing condition. This may be of value in handling other amaryllids. *Oblique* cutting produced no practical results and the method is without value. Bulbs *halved*, *quartered* and cut into *eighths* perpendicularly serve all purposes of rapid multiplication. The exact size of the pieces will be governed in part by the diameters of the propagating material. If of large size they may be made into *eighths*; if of medium size, *quarters* only should be attempted; while if small, *halves* may be used.

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THE EFFECT OF GROWTH SUBSTANCES ON HIPPEASTRUM,
HEMEROCALLIS AND ALSTROEMERIAHAMILTON P. TRAUB, *Florida*

During the present year the effect of growth substances or hormones on rooting and sprouting responses in *Hippeastrum*, *Hemerocallis* and *Alstroemeria* were studied in a preliminary way at Mira Flores. The synthetic growth substances used were indole acetic acid in 1 to 10,000 and 1 to 20,000 dilutions, and the commercial article called Hormodin which was used in the strength listed as so-called 40 B. T. I. units. The exact meaning of this terminology is not explained nor is the active ingredient indicated. The cuttings were soaked in these solutions either at the base, or at both ends, for 24 hours and were then rinsed and planted in a rooting or sprouting medium of equal parts of coarse sand and granulated German peat. The controls or untreated lots were soaked for an equal period in water.

Hippeastrum. The tests were carried out in the spring shortly after the flowering period which is considered the wrong time for cuttage experiments. The time was chosen on purpose in order to determine more clearly any favorable effect of the hormone applications. Typical results with *Hippeastrum* cuttings are shown in Plate 74. The variety, *Frank Wootten*, was used in this experiment, and 8 cuttings were utilized in each series from 1 to 4, inclusive. The number still living and the rooting response after six weeks is shown in the illustration. The controls (series 1) are not rooted and six of these are still alive. For the two concentrations of indole acetic acid (series 2 and 3), four cuttings are rooted in each case, but one more cutting is alive for the weaker concentration, 1 to 20,000 (series 3). The Hormodin treatment (series 4) did not give as good results as the indole acetic acid, but it may be that some other concentration might give better results. Further work with this preparation was discontinued because neither the exact strength nor the active ingredient was known.

Hemerocallis. The tests with *Hemerocallis* were confined to attempts to arrest the early senescence of the flower scape by means of hormone (indole acetic acid) applications in order to secure sprouts at the nodes when sections were then planted in the customary sprouting medium. Some species and varieties produce sprouts abundantly at the nodes on flower scapes but others almost invariably fail to do so. It was with the latter that these experiments were concerned. The sections of the flower scape with two nodes were cut after the flowering period was over, and the upper end was first treated for 8 hours, and then the lower end or base was treated for 16 hours. Controls were similarly treated with water. The experiments were successful only in a limited way for less than 10 per cent formed plantlets as contrasted with less than 5 per cent for the controls. Typical results with hormone treatment are shown in Fig. B, in Plate 74. The section of the flower scapes which formed sprouts remained green for a longer time than those which failed to do so. The scape then gradually turned yellow and died as the sprout with

a thick root or two was developed. Most likely better results could be secured with young flower scapes cut before the flowers open, and this type of material will be used in future work.

Alstroemeria. Mature vegetative shoots of *Alstroemeria pulchella* were treated at the base with 1 to 10,000 indole acetic acid for 24 hours, and then planted in the rooting medium. None rooted, but in many cases the hormone treated lots lived for a longer period than the controls. In future work only very immature sprouts will be used since these are presumably in a more meristematic condition and may respond to hormone treatment.

PROPAGATION OF ISMENE SULPHUR QUEEN BY STEM CUTTAGE

HAMILTON P. TRAUB, *Florida*

The beautiful hybrid Ismene, *Sulphur Queen* (*I. amanceas* X *I. calathina*), is quite rare, but is considered one of the best in this group. The flower is borne on a stout upright peduncle and is of an unusual yellow color. At Mira Flores it blooms faithfully each season, but has so far set no seeds and has made no offsets. This is a case where stem cuttage should be useful.

An experiment carried out during 1936 indicates that it can be very easily propagated by the stem cuttage method (2). On April 14 a large plump bulb was cut into 64 stem cuttings which were planted in the usual manner (2), and on July 26, 43 bulblets were harvested. The number and percentage of bulblets in each size class are indicated in Table 1. This represents bulblets formed for 67 per cent of the cuttings, and at this rate of propagation it should be possible to secure ample commercial stocks of this choice variety to meet all requirements in the not distant future.

TABLE 1.

Showing number and percentage of bulblets in each size class.

Description of size	Average diam. cm.	Number	Percentage	Remarks
Large	1.8	23	53.5	One cutting had also one leaf scale sprouted; one cutting made 3 bulblets.
Medium	1.2	15	34.9	
Small	0.4F	5	11.6	All were on cuttings from upper part of bulb.

The kind of growth responses secured following stem cuttage in this case are indicated in the accompanying illustrations, Plate 75. Figs. 1 to 5, inclusive, show the type of rooting responses and top growth and also the size range. Fig. 6A shows a small portion of leaf scale tissue almost detached from the main portion. It will be noted that this small fraction of leaf scale tissue has given rise to a tiny bulblet at the base. In Fig. 6B this small fraction is shown detached and enlarged—it is shown turned upward with bulblet in upper part of figure. This type of

growth response is similar to that reported by Miss Luyten for *Hippeastrum* (1). Fig. 7 shows a stem cutting with three bulblets.

The bulblets harvested were set out into the nursery row where they will be left until they reach blooming size.

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NEW DAYLILY PROPAGATION METHODS

WYNDHAM HAYWARD, *Florida*

At last, as the result of researches published in the 1936 issue of *HERBERTIA* and in the December 15th, 1936 issue of *Horticulture*, the way has been opened for the amateur and professional grower to multiply his stock of choice and rare varieties almost at will.

These new methods are simple, effective and easy to perform, even in the hands of an unskilled operator. The first of these discoveries, published in last year's *HERBERTIA*, revealed that the *Hemerocallis* crown was amenable to vegetative propagation by cuttage as in case of the ordinary amaryllis (*Hippeastrum*) bulb. In this method the crown of the plant is sliced vertically into sections, with portions of the leaves and roots left adhering. These sections are then rooted in a sterile sand or sand-and-peat medium. As many as 32 sections have been made from a large single crown. Best results are obtained with $\frac{1}{2}$ and $\frac{1}{4}$ sections.

The second method, as outlined in *Horticulture*, will probably take its place as the standard garden method of multiplying the daylily plant by artificial means. It possibly can be performed at any time of the year, but preferably in the spring before the blooming season, for northern climates, or in the spring and fall, in warm climates. These points however are not definitely settled.

The procedure is substantially as follows: the crown tip of a strong, single crown is cut off, preferably at a slant, just below the foliage, and the leafy crown, with the tip of the rhizome adhering, is treated as an ordinary tip cutting and rooted in sand. This tip cutting may be sliced vertically into several sections before rooting with fairly good results.

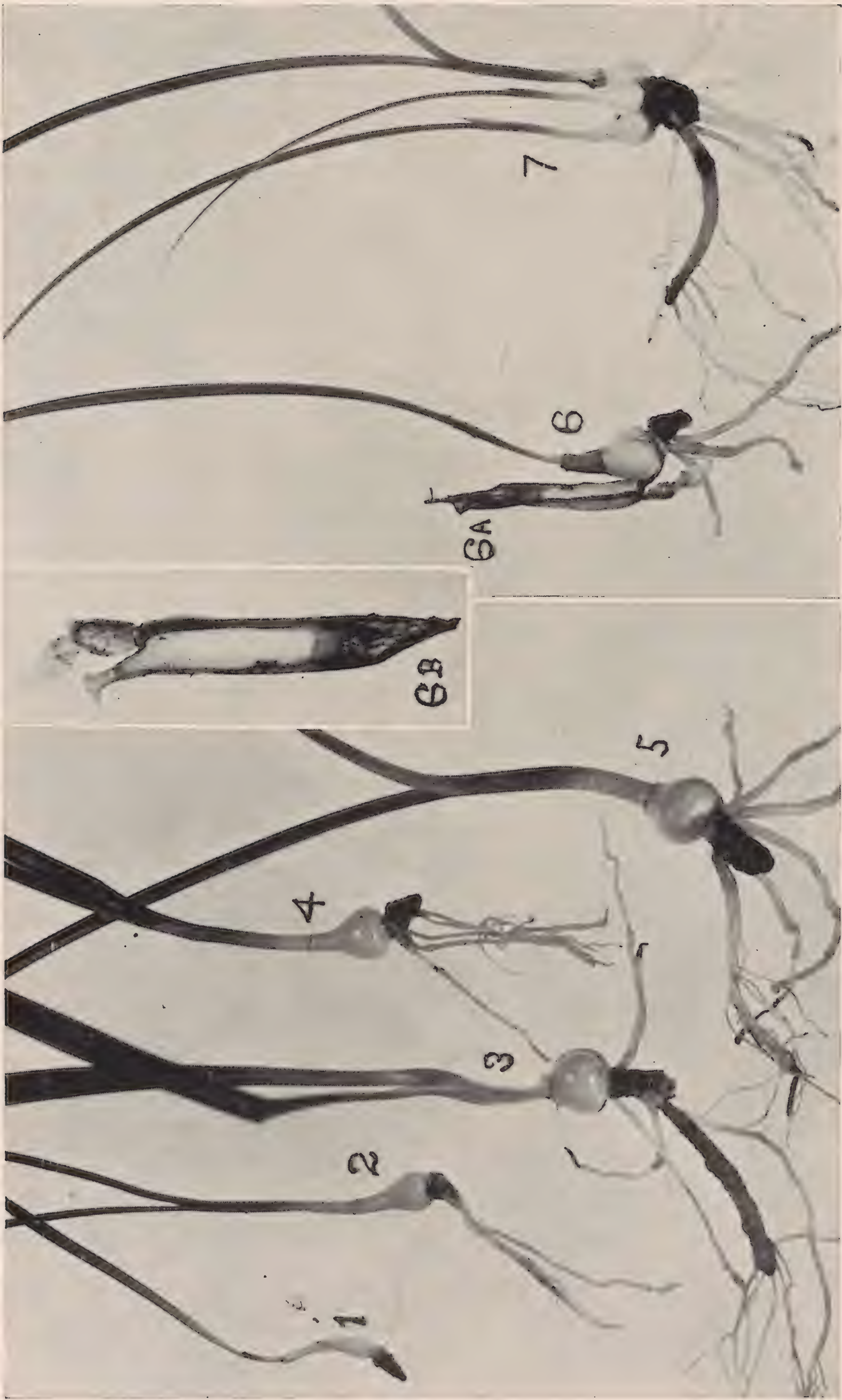
This rooting of the excised crown tip is definitely a contribution of Dr. Traub to scientific horticulture. The writer had already contemplated studies of the reaction of a mutilated rhizome or remainder of the plant in the ground, after the top was cut off, when Dr. Traub announced the results of his experiments, in which the emphasis was placed on the excised tip rather than the portion left in the ground.

As a result of these studies, the writer is able to show that this "excision of tender crown tips" of the daylilies, will bring about a surprising response from the mutilated plant left in the ground by the operation. Experiments conducted at Lakemont Gardens, Winter Park, Florida, by the writer, under the observation of Dr. Traub, have indicated that



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Effect of Hormones on Amaryllids and Hemerocallis



Vegetative Propagation of Ismene Sulphur Queen, approximately natural size, except 6B, enlarged

strong single crown rhizomes of standard and new varieties of *Hemerocallis* hybrids will produce from three and four to as many as seven and eight new sprouts or crowns for the most part at the ends of small rhizomes coming out of the mutilated parent plant. These new sprouts are entirely apart from the plants obtained by cutting and rooting the crown tip, or top of the plant.

The initial studies were made in the Fall of 1936, the plants being cut in late September and October after the main flowering season. The following varieties were used: *Mikado* (Stout); *Soudan* (Stout); *Vesta* (Stout); *Bijou* (Stout); *Chengtu*; *Hemerocallis fulva* var. *rosea*; *Queen of May*; *Margaret Perry* (Perry); *J. A. Crawford*, (Betscher); *Mrs. W. H. Wyman* (Betscher). At least 20 plants in all were included in the trials. None of these failed to sprout. The crown tips rooted in a few weeks in every case, and when replanted in good garden soil, quickly became established and maintained themselves and the great majority flowered in the spring of 1937.

The average sprout production of the mutilated plants was between four and six after three months. Some of them produced as many as five to eight new plants, and a few gave only three or four. Semi-deciduous varieties were the slowest in response. It is evident that different species and varieties will give varying responses under this second method, due to the complex differences in genetical composition of the plants involved. Sufficient has been accomplished so that the method can be recommended for private or commercial growers with scarcely any reservation for the more rapid extension of their plantings of new and rare *Hemerocallis* varieties and species.

It is suggested that the newly sprouted plants be allowed to remain in position until they are well rooted and able to stand transplanting before the clumps are dug up and separated.

The plants obtained by rooting the excised leafy crowns, will bloom the following season, under good culture, as the writer has observed in the spring of 1937. Plants of *Soudan*, *Mikado* and others produced from rooted crown tip cuttings taken in October, 1936, were in full bloom with excellent flowers during April, 1937. In these cases the crown tip was not cut into sections, but rooted entire.

For a general review of the *Hemerocallis* vegetative propagation problem, with reference also to other phases such as the rooting of "proliferations," "dissection of the crown," etc., interested readers are referred to the article entitled "Vegetative Propagation of Daylilies" by Dr. A. B. Stout, of the New York Botanical Garden, in the January, 1937 issue of the *Journal* of the New York Botanical Garden, pages 13-17. There are also earlier discussions of the matter in Dr. Stout's book, *Daylilies*, New York, 1934, and in the United States Department of Agriculture Circular on Daylilies by Mr. B. Y. Morrison, issued several years ago.

METHODS OF PROPAGATING DAYLILIES (HEMEROCALLIS)
VEGETATIVELYHAMILTON P. TRAUB, *Florida*

In 1935 Mr. Wyndham Hayward, the Secretary of the Society, informed the writer that a more rapid method of vegetative propagation for daylilies was very urgently needed especially for the increase of new varieties. Although the increase by the generally recognized method is adequate when fair stocks are available, it is too slow in the case of new varieties, which in many instances remain rare collector's items for a considerable time after a variety is introduced.

The literature on the vegetative propagation of daylilies is apparently not very extensive. The ancient reliable method of dividing the compound rhizome has been described by Morrison (2), Bailey and Bailey (1) and Stout (3), and presumably by other writers on the subject in previous times. Stout (3) in 1934 also described the method of rooting aerial plantlets which develop on the flower scapes of some species and varieties.

A preliminary study by Traub (5) in 1936 showed that the hemerocallis crown is analogous to the bulb of the amaryllids. Most of the amaryllids do not have rhizomes, but some of them do—*Crinum americanum*, *Hippeastrum rutilum*, etc.—and in such cases the similarity is very striking. With this as a starting point efficient methods of vegetative propagation were rapidly worked out based mainly on the stem cuttage technique used with amaryllids.

It was shown that crowns cut vertically into halves, and quarters could be readily rooted and sprouted in appropriate media. Cuttage into a greater number of fractions than four was shown to decrease the sprouting percentages considerably. In the illustration, Plate 76, are shown typical growth responses following vertical cuttage of *Mikado* crowns into $\frac{1}{4}$ and $\frac{1}{8}$ fractions, Figs. 1 and 2, inclusive, 30 days after planting.

The second report was published in *Horticulture* (Boston), December 15, 1936, Vol. 14, No. 24, and this is quoted here,—

The method of hemerocallis propagation by means of excised tender crown tips is very simple and can be used by anyone, for all the equipment that is required is a flat of coarse sand and a shaded location.

In practice, the tender crown tip of hemerocallis is cut off so that a small portion of the stem, consisting of the tip, is taken along together with the adhering leaves. Structurally, such a tender crown tip is equivalent to a tip cutting. The leaves are trimmed to about three inches and the cuttings are inserted into the sand to about one to one and one-half inches. The sand should be kept moist, but not too wet.

When making the cut it is desirable but not necessary to slant it in order to have a little more of the stem on one side of the root base. This seems to hasten sprouting from the mutilated plant, which is left in place in the ground. The tender tip cuttings may also be cut vertically into halves and quarters if desired, but the percentage of sprouting will be cut slightly.

In the initial experiments at Mira Flores, root growth began within a week and the leaves began to elongate within ten days. In three weeks roots were one and one-half inches long and plants had begun to grow. All of the ten tips used in the experiment rooted and formed plants. The rooted tip should be left in



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Vegetative Propagation of Hemerocallis

the sand until the roots are three or more inches long before transplanting. Experience has shown that when tender crown tips are broken off in transplanting hemerocallis or are cut off as described above, one or more new side shoots appear on the mutilated crown. However, the tips should not be broken or cut off too frequently, otherwise the vigor of the plant may be unduly reduced.

Typical results secured by the method of tip cuttage, and tip division are illustrated in Plate 76. Figs. 4 to 6, inclusive, show rooting and sprouting responses after 15 days when whole (Figs. 4a and 4b), half (Fig. 5) and fourth (Fig. 6) tip cuttings are planted in appropriate media.

In connection with these new methods it should be emphasized that strong plants can be maintained if reasonable judgment is used in the frequency of dividing the plants, and if the plants propagated by this method are given a chance to grow strong before division is again attempted. It is of course wrong to merely sprout or root such cuttings and put them on the market. Actual experiments have shown that strong flowering plants can be developed in six months from the time of cutting if plants are put in a favorable environment for growth. Such plants are shown in Plate 76. Fig. 7, a flowering plant developed from a half vertical cutting, and Figs. 8 and 9, show plants grown from $\frac{1}{4}$ and $\frac{1}{8}$ cuttings, made in November 1936. Plants were photographed in April 1937. Similar results have been secured with tip cuttings.

The growth responses following the cutting of the tips of daylily crowns is illustrated in Plate 77. The upper figure shows that 7 sprouts have formed on the decapitated crown of the variety *Bijou* after 6 months. Similarly the lower figure shows 5 rhizomes with crowns formed after six months when a single crown of *Margaret Perry* was decapitated. In Florida under favorable soil conditions, sprouts from crowns decapitated in the fall, and also the rooted tips planted at the same time, flower in the spring.

During the present year, 1937, Stout (4) published a short paper in which he described the method of dividing elongated rhizomes, and discussed the general subject of daylily propagation methods.

For the convenience of the daylily enthusiasts, the available information on daylily propagation methods has been summarized in Table 1.

TABLE 1.

Summary of Methods of Vegetative Propagation for Hemerocallis.

Portion of plant used	Method number.	Essential facts about method	Authority	Remarks
Division of Compound or single rhizome	1	Separation of compound rhi- zomes into sub- or simple rhizomes	Morrison, 1916	Ancient reliable method
	2	Division of elongated single rhizomes into parts	Stout, 1937	Very successful
	3	Separation of entire crowns with roots from single rhi- zomes	Morrison, 1916	Ancient reliable method
	4	Separation of sprouts on crowns after induced etiola- tion	Traub, 1937	Quite successful
Division of crown; also sprouting, decapitated crown bases	5	Vertical cuttage of entire crown into 2, 4, 8 or more fractions	Traub, 1936	½ and ¼ fractions very successful
	6	(a) crown tip, including por- tion of stem, cut off and rooted (b) crown tip as in (a) may be cut vertically into 2 or 4 fractions and rooted	Traub, 1936	Very successful Fairly successful
	7	Crown base left from (a) and (b) above, makes one or more sprouts	Traub, 1936	Very successful
Sprouts from flower scapes	8	Utilization of aerial plantlets developed on flower scapes	Stout, 1934	Very successful
	9	Inducing sprouts on flower scapes not ordinarily produc- ing such by planting portions with nodes treated or not treated with growth sub- stances (hormones)	Traub, 1937	Only partly suc- cessful

All of the methods listed above have been previously described excepting Nos. 4 and 9. Etiolated sprouts are induced to grow on rhizomes by digging and packing in moist sphagnum and storing in the shade (Method No. 4). These sprouts are then cut from the crown and rooted in moist sand (See Plate 76, Fig. 3.) Method No. 9 is described in another brief paper appearing in this issue of HERBERTIA.

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Vegetative Propagation of Hemerocallis—Growth responses following tip pruning



Wyndham Hayward

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Alstroemeria pulchella

Plate 78

6. AMARYLLID CULTURE

REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.

ALSTROEMERIAS IN THE NORTHWEST

HARRY L. STINSON, *Washington*

Northwest Regional Chairman, Trial Collections Committee

The alstroemerias are commonly known as the Peruvian Lilies. The first species were introduced into Europe about 1754 from Peru. The generic name, *Alstroemeria*, was given to them by Linnaeus in honor of a former pupil and friend, Baron Klas von Alstroemer.

Upon first introduction, botanists were inclined to place *Alstroemerias* in the Lily Family because of the leafy stem, lack of spathe valves, and tuberous-root system. Yet it did not entirely fit because of the epigynous character of the ovary. The final result was that systematic botanists broke into the family circle of the Amaryllidaceae and distorted it sufficiently to make it include the Alstroemerids. Even here it did not find a congenial home, for it was different from its neighbors with its leafy stem instead of a scape. Also it had tuberous roots instead of true bulbs. Again the inflorescence was not enclosed in spathe valves. Its leaves were not basal but distributed upon upright stems. So all in all, it did not fit, but since it had to be placed in a Family and as long as systematists did not offer any serious objection, it was left undisturbed.

Here it remained until Dr. J. Hutchinson, of the Royal Botanic Garden, Kew, England, after much study decided that it, together with three other genera, had sufficiently definite and distinctive characteristics to justify raising it to Family status. This he has done in his new book, "The Families of Flowering Plants." In the treatise he has taken four closely related genera, *Alstroemeria*, *Bomarea*, *Leontochir*, and *Schickendantzia*, and has placed them under the *Alstroemeriaceae*.

Whether this classification will be definitely final, only the passing of time and further scientific study and experimentation will determine. So far, it seems to be a happy solution to a vexing problem.

The root system of *Alstroemeria* is one of its peculiarities. It has an under-ground fibro-tuberous rootstock, with terminal buds at the ends from which the stems arise. At or near these terminal buds are three to five long, round, whitish and very brittle tuberous roots, very much like those of the peony or dahlia, but more slender. In some species they are aggregated immediately at the terminal bud, while in others they are more or less scattered along the rootstock. The lengths of the tuberous-roots will vary from four to six inches and from one-quarter to one-half inch in diameter, depending upon the species and the general growth of the plants. At the outer or free ends of the tuberous-roots are the true and feeding roots.

These fascicled tuberous roots are not true tubers. Tubers are modified stems and have eyes (buds) like a potato from which new plants

sprout and grow. At various times broken segments of the enlarged roots have been placed in a propagating bed under various conditions to determine whether they would eventually develop adventitious buds and grow, but at no time have they ever shown any tendency to put forth new growth. They just pass away after lying dormant several months.

Deposits of starch, or farinaceous matter, constitute the thickening substance of the enlarged roots, and is stored up for the future use by the plant. From reports, some species are used for food by natives in South America.

As previously mentioned, the aerial stems rise from these terminal buds. From each bud there will develop two kinds of stems. The first kind to appear will be the sterile or vegetative one with leaves only. They come through the ground very early in the spring and grow to a height of one to three feet. Those that come up first do not attain the height of those that come later in the spring. When the weather has become settled, the floral stems will put in their appearance and will soon surpass and exceed the height of the sterile stems. They are stiff, slender, and wirey and may need staking if they are in an exposed position. Their height will range from one to four feet depending upon the species, the length of time the plants have been established, and the soil conditions. The stems do not have any roots attached to them directly, nor have they developed any when they have been detached with a heel and put in a propagating bed to see if they would "strike" root.

The leaves exhibit a very singular anomaly. They are borne upon a twisted petiole, so that what would ordinarily be the under side becomes the top surface of the leaf, with a resultant reversal of the internal anatomy of cells and stomata. The leaves are neither fleshy, coriaceous, lorate, nor linear like the majority of the amaryllids, but are rather thin and soft. In shape the leaves will vary from oblong-spatulate, obovate, or oblanceolate to almost linear with tips from acute to blunt in the several species. Some species show a tendency to be ciliate on some of the leaves with very short stiff cilia; however it does not seem to be constant thruout any species.

The leaves are petioled. Some species have very short petioles that vary from one-eighth inch to two to three inches in length. The leaf blade on the long ones gradually tapers down to the stems, in some cases almost parallel, giving the petiole a compressed or winged effect. The leaves are alternate and in some species are scattered along the stems, more on the sterile ones than on the floral stems. In others they are aggregated at the terminal end, with scarious bracts along the stem.

The inflorescence is in single or compound rayed umbels terminating the floral stems. The umbel will bear from three to nine rays with one to five flowers on each. Instead of the inflorescence being enclosed in spathe valves, it is subtended by a whorl of leaves, varying somewhat in the several species.

The individual flower is carried upon a pedicel two to three inches long. The flower is about two inches long and a little less in width, funnel shaped and flaring like a small lily. The flowers are epigynous, with the perianth cut almost to the ovary and the petals are arranged in two

circles of dissimilar segments. The outer circle of three segments is broad and inclined to be cuspidate, while the inner three are narrower. The upper two usually bear distinctive pencilings or dashes of contrasting color to the main color. The lower segment of the inner three is the narrowest of them all and is partially concealed by the six declined and recurved stamens.

The flowers are carried in an upright position, which sets them off to a much better advantage than if they were inclined to be pendulous. Each flower is open for a week to ten days, depending upon the weather and water supply available. The flowering period is extended over a long time, starting the latter part of June and in many instances continuing until September. In the compound rayed species the inside flower blooms first, and then the next adjacent flowers open in turn. The result is a continuous show of color.

Today much more consideration is being given to floral arrangement and color combinations than in previous times. This being the case, the decorator or florist may select from a wide range of colors the alstroemeria that fits any color scheme, for they come in colors ranging from pure white (*A. pelegrina alba*) thru mauve, pink, creamy yellow to pure yellow, orange, red tipped with green, lilac, and shades or combinations of these colors. All of the colors are soft and will harmonize with practically all other flowers.

When the flowers fade and drop away, the seed capsules develop with their geometric design and continue to give the plant a pleasing appearance. Externally they have a glistening sheen that continues until they are ripe. The capsules are three carpelled with the seed arranged around a central placenta. When the seeds are ripe and the capsule has lost sufficient moisture, it snaps open violently and throws the seeds several feet in all directions. So if the seeds are wanted, they must be gathered before they are dry enough to dehisce.

The seed are spherical in shape, about the size of "bird shot," and thickly beset with minute nobby projections. In color they will vary from yellow to brown.

To all indications the alstroemerias prefer a well drained, loamy soil. Although they need abundant water during their growing season, they must not stand in it with wet feet nor dry out and bake hard in the summer. The soil must be worked to a depth of twelve to fourteen inches to accommodate the tuberous-roots which adjust themselves to a varying depth of eight to ten inches. Into this soil bed must be incorporated organic material, either leafmold or well decayed and disintegrated barnyard fertilizer.

At our latitude here at Seattle they seem to do equally well in full sun or partial shade, although those in more open and exposed positions seem to be inferior to those grown in the *sheltered locations*.

As yet no experiments have been made to determine what is the best effective acidity of the soil (pH) for alstroemerias, but to all appearances they are perfectly contented in a soil that tests about pH 6.5.

In English books on floriculture, reference is made quite frequently to growing alstroemerias in pots; however, no detailed instructions are

given as to the best methods of growing. At present no thorough trials have been conducted to determine the best cultural procedure with them in pots under our Northwest conditions. Some observations of a stray plant of *A. aurantiaca* var. *lutea* would seem to indicate that it could be forced in the greenhouse to bloom in January or February. If so, this would prove very fortunate to the florist as it would provide a yellow flower to the trade when such a color is scarce. Further experiments will be conducted along these lines this coming year, and the results reported later.

The question of hardiness is relative and is closely correlated with the latitude and climatic factors of the specific region under question. The Puget Sound area is somewhat peculiar in that it has, after the first fall frosts, a cool growing season in which many winter rooting plants put forth early vegetative growth, only to be destroyed when really cold weather comes in January. This would not be the case in a region where the cold was uniform and continuous after the first freeze.

Authorities differ as to what species are hardy and what degrees of frost they will stand under various conditions. Seattle can usually count on at least one cold snap in January or February, during which the thermometer will frequently fall and hover around six to sixteen degrees (Fahrenheit) above zero for several days. This happens usually when there is no snow on the ground to afford protection against the cold. Under these conditions both *A. chilensis*, hybrids and *A. aurantiaca* and its variety *lutea* have proven hardy when given a thin mulch of peat or straw to protect against heaving. Bailey also states that *A. brasilensis* is hardy. It has not been tried because no plants are available in this country. *A. haemantha* survived our usual winter in a seed flat in a sunken cold frame with only a lath frame covering. Otherwise the stock at hand has been too limited to risk losing any in experimenting, but as soon as sufficient stock is available, trials will be made to test their winter hardiness.

Two methods of propagation are available—seedage and division. At present seeds of alstroemeria are not in general trade in America nor in Europe, but when the seeds can be obtained, seedage is a fairly certain but slow way to increase stock to blooming size. Seeds of all species seem to germinate quite readily, some more quickly than others, but all eventually come up, perhaps not until the second year. *A. pulchella* (*psittacina*) germinated in about four weeks in a pot set in a warm location in the green-house, while *A. revoluta* has taken about six months when sown in a seed flat outside and later moved into a cool house at the approach of cold weather. Some seeds of *A. chilensis* sown in December a year ago are just now coming through the soil (Feb. 10)—a period of fourteen months. In all probability it was old seed as it was from an English source sold locally. If fresh seeds are sown, they sprout in forty to sixty days in a temperature of forty-five to seventy in a greenhouse. Last year seeds sown on November 25 under the same conditions produced plants which bloomed in May and June; after blooming, they were allowed to become dormant and were then set out in the open, where they were to remain permanently.

A trial is being conducted to determine whether they germinate better at high or low temperature. Lots of twenty-five seeds each of *A. aurantiaca* and *A. chilensis* were placed in pots in warm, cool, and cold situations, and these are being watched to see which will germinate first. Some seeds of *A. chilensis* shelled out on the ground last fall and have lain there all the fall and winter through twelve degrees freezing weather and then were sown in a pot in a sixty degree temperature. They are being watched to see if they will withstand such treatment and still germinate.

If seedage is employed, it is recommended that seeds be sown thinly about one inch deep and that the seedlings be permitted to remain in the seed bed for the first season without transplanting. There is seemingly one short period just before they start to form their tubercles when they can be transplanted without disastrous results. Thus it is safer to let them make their first year's growth before removing to the permanent beds.

Under our climatic conditions it seems best to plant the seeds in a greenhouse about December or January, or about September or even March, in a non-freezing cold frame. In a southern climate seeds should be planted as soon as ripe. The seedlings should bloom the next spring in May or June. As soon as the tops turn yellow, the plants may be taken up, separated, and set out in permanent beds, or they may be stored in a dormant condition, if desired, in dry sand or peat in a dry and cool place. I have some roots now (Feb. 12) that have been dormant since last June.

When planting it is best to set them out in rows or beds, five or six inches deep and eight or ten inches apart. August and September apparently are the optimum months for planting. They make late fall growth and show a tendency to come up during December. If they do so before spring weather has become settled, they should have a light mulch to protect them against frost and heaving.

In time the rows will become a crowded bed of roots. Then they should be dug as soon as the tops turn yellow. The soil should be shaken out and the clumps divided so that each plantlet has a terminal bud with each clumplet of tuberous roots. Care should be exercised not to mutilate them more than is necessary, for these fleshy roots contain the food for the succeeding year's growth. Experience here has shown that roots planted in August or September will bloom the following June and July, while in Southern California and Florida the blooming period will probably be in April and May. Their natural tendency is to spread somewhat and make a nice, colorful clump; however, if the master of the garden is geometrically inclined, he may preserve the outline by pulling up the wandering errants and confining them to the straight and narrow. In the main they are very well behaved and like Abou Ben Aben "may their tribe increase."

For decorative purposes they are excellent both as a cut flower for interior use or as a subject for the perennial border. When cut and placed in the house, they last from eight to ten days; the successive buds that come on make them last much longer than if they were single flowers.

Their colors—mellow, and in the pastel shades—lend themselves to various floral arrangements in almost every room. As a subject for the semi-hardy border they are unexcelled and may be used either as background for lower growing plants or as a foreground for the taller growing perennials like delphiniums. They will harmonize with almost all other colors, and with their long blooming season of six to eight weeks, they can be depended upon to give a good account of themselves.

There seems to be an erroneous impression among my Eastern friends that the alstroemerias are “galloping wild” over our countryside. Such a conception is not true, for in fact when it was suggested that some study and observation of their cultural requirements be made for the Society, it was with some difficulty that a source of supply of even the common ones was found near by. Since then, several small clumps have been located. They are not vulgarly common. An acquaintance had a plant of *A. aurantiaca*, and when she made inquiry of several of our local florists to indentify it for her, they were unable to do so. It must be said in all good faith that our florists are capable men, so it is apparent that the alstroemeria hereabouts is practically unknown. A few years ago, a float in a floral parade was observed to be decorated with *A. aurantiaca* var. *lutea*. Upon inquiry it was found that they had been sent to the florist who used them and that he did not know their name nor where they had been grown. At one time some were grown upon Vashon Island here in Puget Sound, but the grower abandoned them. The few strays he had left were purchased from him a year ago.

A nursery in Portland, Oregon lists the two varieties of *A. aurantiaca*. How large a stock he has is unknown. A wholesale florist of San Francisco listed “Peruvian Lilies” in a trade journal. In answer to my enquiry he was unable to give even the species name. From his general description of them they must be *A. aurantiaca*. They are grown at Colma, a city just south of the Golden Gate, in a region that is cooled during summer by the fogs that drift in from the Pacific Ocean. Aside from these plantings no large commercial growers have been located, with the exception of Mr. Orpet.

A search of available literature reveals that authorities differ as to the number of species known, but the number is between forty and fifty. Baker in his “Handbook on the Amaryllideae of 1888, gives forty-four, while Bailey in the *Cyclopedia of Horticulture* sets down the number as fifty, but describes only ten. From this it is apparent that many more are to be found and introduced into the horticultural world. Even in countries where other species are known to exist, they are practically unobtainable through ordinary trade channels. Efforts to secure seeds of plants indigenous to the Argentine and Chile have been fruitless. However, a correspondent in Paraguay has offered to supply four species previously unreported. These importations will be keenly watched.

Unfortunately many of the illustrations in the literature have, since publication, been found to be misnamed, and this fact has caused much of the present confusion. The *botanical key* used by Bailey, which is based upon purely vegetative characteristics, is inadequate to differen-

tiate the several species. Hopes are entertained that when more species can be studied, a more definite key can be evolved.

The most complete collections listed in nursery catalogues are those of Van Tubergen, Haarlem, Holland; D. J. W. Chandler, Tecoma, Victoria, Australia; and Philip Montague, Frankston, Australia.

The following composite list, with synonyms, is taken from both English and American authorities:

1. *A. pulchella*, (*A. psitiacina*) dark red, tipped with green dashed with brown. Brazil.
2. *A. Chilensis*, Chilean Lily, pastel colors, pencilled lightly with maroon. Chile.
3. *A. pelegrina*, lilac pencilled with red purple. Chile
A. pelegrina, var. *alba*, white.
4. *A. haemantha*, (*A. Simsii*, *A. barclayana*) red tipped green with red purple spots on a red-yellow. Chile.
5. *A. aurantiaca*, (*A. aurea*), orange-yellow pencilled brown. Chile.
A. aurantiaca, var. *lutea*, bright yellow pencilled brown. Chile.
6. *A. brasiliensis*, reddish yellow, spotted brown. Brazil.
7. *A. versicolor*, (*A. peruviana*, *A. sulphurea*, *A. tigrina*) yellow spotted purple. Chile.
A. versicolor, var. *niveo-marginata*, (*A. Hookeri*, *A. pallida*, *A. rosea*).
8. *A. Ligtu*, whitish, lilac to pale red. Chile.
A. Ligtu, var. *pulchra*, (*A. Flos-Martini*, *A. bicolor*).
A. Ligtu, var. *caryophyllea*, red and red striped. Brazil.
9. *A. violacea*, bright violet, spotted. Chile.
10. *A. revoluta*, yellowish and spotted. Chile.

For additional species indigenous to the Argentine, Chile, and other Andean regions, see reports on the amaryllids of those countries and regions in previous volumes of *Herbertia*.

These remarks on a little known Genus of the Alstroemeraceae are submitted to the members of the Society with the realization that they are only preliminary. I trust that the coming years will add to our knowledge of them.

ALSTROEMERIA PELEGRINA

Those interested in alstroemerias should consult the September 1937 issue of *The Pacific Sunset Monthly*. It features *Alstroemeria pelegrina* and *A. pelegrina alba* in color on the cover and includes an article about alstroemerias in which the work of W. M. James and E. O. Orpet is mentioned. The address of the Sunset publishers, Lane Publishing Co., is 376 Sacramento St., San Francisco, Calif.

—H. P. T.

ALSTROEMERIA PULCHELLA

WYNDHAM HAYWARD, *Florida*

This interesting species of *Alstroemeria*, which is known by both the names *A. pulchella* and *A. psittacina*, seems to be the only one which has made a home for itself in Florida gardens.

It is the species mentioned in the 1935 Year Book by the writer as having been found growing in the late Theodore L. Mead's garden at Oviedo, Fla., where Mr. Mead stated it had been established for more than 10 years, but could not recall the name.

Plants of this species have been received also from Mrs. John H. Churchwell of Jacksonville, where they likewise are thrifty garden specimens. It is reported in Jacksonville that the species was first introduced into that section from old gardens in lower Louisiana.

It is an easy species of *Alstroemeria* to grow, and produces tall vigorous bloom stems under best conditions, in early summer. The plants go practically dormant in mid-summer and are best transplanted at that time. The roots are a series of little tubers attached to a central crown, from which the sprouts come. These may be dried a day or two in the shade, and wrapped in tissue paper and shipped several thousand miles without loss of vitality.

Under good garden conditions, the plants multiply prodigiously. The foliage is typically alstroemeria-like and very attractive. The plants grow all winter in Florida. The flowers are dark red with brownish spots with a lighter green edging in the throat. The illustration, Plate 78, shows a typical flower stalk produced by Dr. Traub at Mira Flores, under good culture. The species is listed as a native of Brazil. Its hardiness is undetermined. It will set seeds readily in Florida. Unless kept in check the plant may almost become a weed in rich soil.

The best garden conditions suitable to its growth are a medium rich sandy loam, with steady moisture content, but excellent drainage conditions. It likes at least half shade for best results.

ALSTROEMERIAS IN RHODE ISLAND

MRS. MARY H. CAMPBELL,

President, Rhode Island Federation of Garden Clubs

Plants of *Alstroemeria aurantiaca* and *A. lutea* were imported some three years ago by my mother the late Mrs. R. G. Hazard of Peace Dale, R. I., from England. These were planted in a rich, friable soil, at the base of a twelve foot brick wall, with a southern exposure.

Peace Dale is a small town in Southern Rhode Island, in that part of the state known as the "South County," and having possibly a slightly milder climate than other parts of New England, being so close to the Atlantic Ocean and Narragansett Bay.

These imported plants grew thriftily, and have increased tremendously in their original location, so that now there are masses of the interesting yellow and orange flowers to be seen in that border during late July and August. It was with the purpose of helping to make this very worth while garden subject better known that some of the alstro-



Mary Early Joyce, Kenya

See page 220

*Hybrid Amaryllis (Hippeastrum) naturalized in the garden of Mrs
Mary Early Joyce, Kenya, British East Africa*



Frank Vasku

See page 235

Hippeastrum rutilum var. *crocatum*

Plate 80

meria blooms were used by me in an oriental arrangement piece at the Newport, R. I., Flower Show during the summer of 1936. The flowers attracted wide attention in the press and with thousands of flower show visitors.

The culture of this tuberous rooted perennial has proved to be rather simple in Rhode Island, and the plants succeed remarkably well with good care. Winter protection is given to the alstroemeria beds in the form of a heavy mulch of oak leaves six or eight inches deep. The plants came through the severe winter of 1933-34 without serious injury, although the thermometer dropped to 30 degrees below zero, Fahrenheit.

Other alstroemeria plantings have been made on Mrs. Hazard's estate in open borders facing South, with the protection of an arbor vitae hedge on the north. A deep, rich soil has been provided and the ground is covered with a thick layer of oak leaves in winter. The result has been to produce very thrifty plants which are increasing in size from year to year. There are also plants of *A. aurantiaca* and *A. lutea* in cold frames and in the greenhouse, where they succeed equally well. Here also are specimens of *A. psittacina*, and *A. ligtu*—the latter from seed obtained in California during the winter of 1935, and which have not bloomed as yet.

Alstroemeria is a most welcome addition to our gardens—very decorative as to color and graceful in outline. The individual flowers come out from day to day in water which makes them last a long time when cut. Once established in the garden, the plants make a thick mass of lily-like stems which are very effective in the blooming season.

(Continued from page 161)

grasses, *Polygalas*, *Sabbatias*, etc. The bulb lies deep in the ground with a mat of thick, heavy roots below. The very long neck and upper part of the bulb have a dark, fibrous coating and the neck is very crooked. The leaves, usually three are twisted above; channeled, but flattened at the bases, and rounded on the back. The scape is flattened but not sharp-edged and is also slightly twisted. The tube of the flower is almost as long as the scape and it as well as the perianth are pale greenish-yellow, though the very large staminal cup is snowy white. The scape is crowned by a single flower, which usually stands slightly above the surrounding vegetation and after anthesis the delicate cup fades and disappears, leaving the spreading perianth, three lobes of which always seem to tip down, the other three spreading upwards, giving a startlingly spidery effect. Dr. Small states that this species is only slightly fragrant, which it undoubtedly is in the daytime. At night however, it is intensely and overpoweringly fragrant. The buds burst suddenly into bloom, about sundown with barely perceptible odor and it is not until eight or nine o'clock that the odor is particularly noticeable and is diminished again next morning. It is probable that all the species are pollinated by night-flying insects.

I hope to ultimately secure a collection of all the Florida *Hymenocallis* species as well as many of the South American ones, and I plan to follow this up with further notes in future issues of *Herbertia*.

AMARYLLIDS AT KIRSTENBOSCH

L. B. CREASEY,

National Botanic Gardens, Kirstenbosch, Union of South Africa

By far the largest portion of South Africa has a summer rainfall, but the extreme south-western corner of the Western Cape Province experiences a winter precipitation. As a general rule, the majority of summer rainfall plants make their leaf-growth during summer, while those from winter rainfall areas produce their foliage in winter and spring. There is some over-lapping and the exact period for growth depends upon the species, the locality and the date when the first rains fall.

These facts must be considered by all who grow South African plants and should be compared with the annual quantity of rain, altitude, rooting medium, situation, aspect and, in the case of bulbs, the depth at which they grow.

The National Botanic Gardens of South Africa lie on the eastern slopes of Table Mountain, but are reasonably well protected from the strong south-east winds. The cultivated portion extends from 500 to about 800 feet, thence rising rapidly to the great cliffs of the mountain itself. The average annual rainfall is 57 inches, practically all of which falls between May and the spring month of October. We may have occasional showers at the beginning and end of summer, but the hot months of November, December, January and February are dry. In winter, low temperatures are recorded, but no frost.

At Kirstenbosch we grow amaryllids under outdoor conditions, choosing good positions in preference to mixing special composts. The provision of water during summer has produced remarkably vigorous growth in certain *woody* plants from summer rainfall areas. Whilst bulbous subjects are not so visibly demonstrative, those accustomed to moist natural situations have benefited from such treatment.

We have no difficulty with *Amaryllis belladonna*, which is one of our local natives and essentially a winter rainfall plant. Apart from wild specimens on the mountain-side, there are patches and drifts planted amongst the cycad collection, where they have a light ground-cover of shrubs, ferns, asparagus and tussocky grass. This is a steep slope, so that only about one-third of the annual rainfall reaches the bulbs. The soil is a good deep loam, allowing us to sink the bulbs 9 to 12 inches deep, which they appreciate. We plant after the foliage has died in November and they usually miss flowering in the first season, but do extremely well thereafter. Seeds are freely produced and these must be sown as soon as ripe.

Ammocharis falcata and *A. coccinea* flourish in full sun, annually providing their umbels of pink or deep rose, fragrant flowers in January and February. At Kirstenbosch the leaves, which lie flat on the soil-surface, are borne at the same time as the flowers and continue for long afterwards. *Ammocharis* are principally summer rainfall plants, but enjoy our conditions and do not require a rich soil.

Anoiganthus brevifolius grows and multiplies in a perpetually moist position near a stream and partially shaded by tree ferns. Although from summer rainfall localities, it is naturally a wet-ground plant, and the nodding heads of yellow flowers are an annual delight in summer.

Burnsvigias are well-known overseas, particularly the very handsome *B. Josephinae*—a summer rainfall plant. In contrast we have *B. gigantea*, a winter rainfall species which makes its foliage at that season, and then has a long rest before producing its flowers in the following March. This has natural climatic conditions at Kirstenbosch and is happy in sandy soil, thrusting up its stout flower-stalk and from this, throwing out on long pedicels, the large head of blood-red, curiously curved flowers. Summer rainfall Brunsvigias also do well at Kirstenbosch, and the genus seems to be more amenable than most to conditions which are foreign to the natural habitat. We have *B. sphaerocarpa*, with enormous umbels of bright pink flowers on 14-inch pedicles, and broad, wavy-edged, semi-prostrate leaves that die off as the flowers open and are often immediately replaced with the first rains. We give all Brunsvigias full sun.

Clivias are troublesome. In a shady part of the garden they neither grew nor flowered, but are making good growth in tins under a shade-house. With perseverance and adequate summer watering, I believe we will yet grow them well, despite our wet and comparatively cold winters. I think the secret is to get *young* plants established and then leave them alone. Clivias are evergreen and must have shade, but they pass through a dormant season in their natural summer rainfall localities of the Transvaal, Natal and the Eastern Province. In Natal the rains commence lightly in October, become more heavy towards Christmas and gradually cease about May. Clivias, growing on rock-ledges where water runs in summer, are absolutely dried out in winter, but retain their leaves. They flower from spring or early summer till Christmas or soon after.

We have many species of *Crinum* at Kirstenbosch, and all take kindly to our climate, even though most are from the strictly summer rainfall regions of Natal and the Eastern Province. In moist and partially shaded positions *C. longifolium* makes enormous leaves, but flowers equally well in drier and sunnier places, although as a matter of course we supply Crinums with water in summer. *C. Macowani* and *C. Bainesii* do well in similar positions, but I fancy *C. Moorei* prefers shade. Crinums seed freely, but the seeds will not keep and must be sown immediately. This year *C. Forbesianum* showed how decorative it can be in the seed stage, when the pods are ripe and like brilliant red inverted onions. Since the stem normally collapses when the seeds are ripe (Nature's provision for bringing the latter in contact with the soil), the pods usually rot at Kirstenbosch before they attain full colour. Our Crinums are deciduous, although some have a very short resting season. *C. Moorei* may retain its leaves past the end of summer, but producing a new crop with the first rains and simultaneously discarding the old foliage. We do not plant Crinums deeply, especially species which form a definite trunk. We leave the papery crowns exposed.

We have had variable results with *Cyrtanthus* species, but are still experimenting with them. On a rather dry rockbank in shade, *C. angustifolius* flowers annually, but I think it would benefit by having a moister position. It has a wide natural range and occurs in both summer and winter rainfall areas. The remarkable *C. obliquus*, which comes from the Eastern Province, is definitely a summer rainfall plant. With an open position and deep soil, in various parts of the garden *C. obliquus* happily produces its stout, flat, twisted leaves, and the scapes of pendent, green and orange flowers. *C. parviflorus* flowers very well in a lightly shaded and constantly moist position alongside a stream. It is fully deciduous, but the bulb does not rot in winter.

Haemanthus Katherineae is well-known overseas and its culture is understood. It comes from Natal and the Transvaal, requires a complete rest when dormant, and at Kirstenbosch we have to start it in large tins, sinking these outside when the bulbs are in flower. *H. Katherineae* does not like strong sunlight. In open situations or amongst undergrowth we have *H. coccineus* wild in this district. It produces compact "brushes" of bright red on stems of 6 or 8 inches in March, the two flat leaves appearing later with the rains. It is satisfied with almost any type of soil, but is especially prevalent in the more sandy places, whether they be moist or dry. It has a fairly long dormant season. Among other species of *Haemanthus* we may dwell upon *H. Nortieri*, which comes from an area of late winter and strictly limited rainfall. It bears only one erect, flat leaf in its season of growth, the flowers being a compact reddish tuft on a red stalk. Seeds are freely produced here. It is satisfactory with shallow planting and a sunny aspect, and is naturally accustomed to a poor, stony soil, bone-dry over most of the year.

The genus *Hessea* is rather difficult in our locality of heavy and prolonged winter rainfall, but we give these also shallow planting in a light, stony soil in full sun. Like *Haemanthus Nortieri*, the *Hesseas* come from the semi-arid areas of the Western Cape where the winter rain does not fall till July or August, and even then is of short duration and small quantity. In cultivation, both *Haemanthus Nortieri* and *Hessea* species want sharp drainage. We have *Hessea karooica*, *H. unguiculata* and *H. Zeyheri*. The latter is a delightful species, the umbels of deep rose, starry flowers opening here in May, the leaves being half-developed at that time.

Nerines are well represented at Kirstenbosch. There are summer and winter flowering Nerines, and *N. undulata* extends to both areas. Some, such as *N. Masonorum*, germinate freely in outside seed-beds in sun and grow equally well in shade. *N. appendiculata*, from Natal, flourishes in a moist position by a stream and in full sunlight. Our own local *N. sarniensis* grows amongst the *Amaryllis* on the previously mentioned bank of deep soil with a light ground-cover. It is wholly deciduous, making leaf-growth in winter. All broad-leaved Nerines seem to be quite herbaceous, while many narrow-leaved species are more or less evergreen. Nerines grow under a wide range of natural conditions, and I am opposed to the wholesale drying-off of *all* species generally practiced under pot-culture. The species should be treated individually,

and any which show a tendency to retain their foliage should not be *completely* dried-off. Even when dealing with a species which requires a rest, some thought for the bulb is required. The old practice of growing the bulbs in the smallest possible pots which were dried-off close to a green-house roof under a hot sun, should be checked against a more moderate treatment.

We have *Vallota purpurea* in a moist position near a pond. This comes from the George district, where winter and summer rainfall areas meet, and where rain may fall any month in the year. Consequently, in cultivation *Vallota purpurea* must not be completely dried-off in winter. Neither should it be disturbed any more than is absolutely necessary, and when it is lifted or potted this should be done immediately after flowering. It likes a fairly rich peaty loam.

Since Dr. Hutchinson's classification now places *Agapanthus* and *Tulbaghia* in the Amaryllidaceae, I must refer briefly to them. *Agapanthus* needs no introduction, being well-known as a tub-plant. At Kirstenbosch the various species give a long season of flower from November till the end of March. This wide-spread genus is of easy culture. Blue flowers always appear to best advantage in shade (or by evening light), but *Agapanthus* thoroughly enjoys full sun. They like abundant water in summer, even though they will, when established, tolerate dry conditions under trees. In the latter position, seedlings appear round the old plants in spring at Kirstenbosch, but eventually die through drought. This explains why *Agapanthus* are often found naturally in moist situations. Certain species are generally regarded as deciduous. Experience at Kirstenbosch seems to indicate that this character is dependent upon the season and is not necessarily an annual habit of any species, except *A. campanulatus*, from Natal. All species, including those from summer rainfall areas, show no objection to our winter rains, and under cultivation overseas a reduction of the water supply in winter is all that is necessary; but *A. campanulatus*, being deciduous, would probably appreciate a more decided rest.

Of the many species of *Tulbaghia*, the most-attractive we have are *T. violacea* and *T. pulchella*, plus the white form of the latter. *T. violacea* has been grown successfully outside in a warm position in England. At Kirstenbosch its flowers are nearly always with us, if the bulbs are kept in vigorous growth by summer watering. *T. pulchella* has larger flowers of a deeper mixture of lavender and lilac, and has broader leaves. This only flowers once in spring or early summer and the habit is not so good owing to the growth being exceptionally soft. The variety *alba* is a pure white edition. *Tulbaghias* ask for no special treatment, apart from watering while in growth.

In this short article it has been impossible to avoid generalities. I have referred only to genera of decorative horticultural merit, but it is hoped that this brief survey of amaryllids at Kirstenbosch will provide suggestions applicable to some of the reader's problems under American conditions.

HYBRID AMARYLLIS NATURALIZED IN KENYA, EAST AFRICA

MRS. FRANK JOYCE,
Kenya, British East Africa

Mrs. Joyce writes under date of Febr. 2, 1937, "Here we were very short of rain the last 8 months of 1936; only 9.14 inches, but the hybrid *Hippeastrums* have never flowered so well—They began the end of August and the last two flowers scapes are only fading now" (See Plate 79).

HAEMANTHUS KATHERINAE

MRS. W. E. MACARTHUR, *Florida*

In November, 1935 I obtained permission to import bulbs of the African Blood Lily for my amaryllid collection. This species might be more correctly styled the Tongaat Lily, as it was given to the world from the Tongaat District of South Africa.

Because of a prolonged growing season in South Africa, the bulbs were held until June, 1936 reaching me July 17, 1936 in splendid condition after a long journey from Natal.

The bulbs were immediately potted in a mixture of leaf mold, rotted dairy fertilizer and good garden soil and placed in semi-shade. They remained dormant until the latter part of September, 1936 when signs of life appeared. The growth was normal, the leaves were borne on a short stalk. The leaves are broad, pointed and deeply veined and each plant has from four to nine.

These plants remained out-doors all winter, sheltered from strong winds and protected by a canvas cover when temperature dropped to freezing. They showed no signs of wilting at any exposure proving themselves to be quite hardy. I believe they can be planted in suitable positions in the average Florida garden. They are free so far from insects and diseases.

As yet they show no signs of a bloom stalk, and probably they resent moving. However, a little white nose of a shoot is developing on the side of largest bulb which may be the beginning of a bloom scape, or it may be the formation of a new bulb as new leaves are coming out through center of new shoot.

In a Durban, South Africa newspaper Miss Mary Ritchie gives an interesting description of this species,—"Deep in the seclusion of the forest in the dim recesses of the glade grow the lovely *Haemanthus Katherinae* far out of sight where the fallen leaves of untold years have enriched the soil. Where no rough winds come, no scorching suns, she holds her court in the green aisles of the forests, guarded on one side by the deepest of bogs and on the other by the sea and high over head the birdlike flowers of the *Strelitzia* spread out to guard her bower."

HOSTA IN FLORIDA

FRANK VASKU, *Florida*

In the spring of 1935 I received from Indiana, among other plants two crowns with roots. There was no name attached and inquiry brought no information. Knowing nothing about them, I potted them in black mucky soil and placed them in shade. They soon started growth, one sent up narrow, pointed, lanceolate leaves of medium green, the other broad, somewhat cordate ones of a light yellowish-green color. They were kept well watered and occasionally fertilized either with liquid manure or nitrate dissolved in water. The small leaved one bloomed that summer and proved to be *Hosta*, probably *H. coerulea*. Its flower stalk gradually lengthened letting a few small bells of lavender open each day for weeks, but it refused to set seed. The other filled the pot with beautiful leaves, but did not bloom that summer.

During the following winter the foliage died down and it appeared that the plants were lost, but growth was vigorously resumed in the spring. No thought was given to reporting on them so no accurate data can be given, but about July *H. coerulea* sent up several flower spikes and soon its fairy bells delighted our eyes. A little later the other plant too began slowly to push up a flower spike. To our impatient eagerness it seemed weeks before the first snowwhite, fragrant, daylily-like bell opened. Then as day after day that flower stalk lengthened opening a few large bells each day I no longer wondered that it was so slow in pushing that spike up for it had a tremendous load to push. But, whatever *Hosta plantaginea*, which it proved to be, may be in other parts of the country, with us "Night Lily" would be far more appropriate name than "Day Lily" as it is sometimes listed in catalogs. It always opens its new bells about mid-afternoon and by mid-morning they were on the wane again. It set a little seed.

On account of being in the same pot for two years, the plants were very much pot-bound but each had a number of crowns so that it appeared each could be divided. Accordingly this spring I took them out of their containers and proceeded to divide them. *H. coerulea* was so matted that I took a knife and cut right through the mass making four pieces of it. *H. plantaginea* was not matted so badly and I could separate the roots without cutting. The divisions were set right out in the open ground in a shaded place. At the present time, April 15th, they are all growing and appear perfectly healthy. It seems, therefore, that *Hosta* can be successfully grown in Florida.

HYBRID AMARYLLIS IN MARYLAND

GEORGE E. WATERS, *Maryland*

To my way of thinking, the hybrid amaryllis is the easiest of all flowering bulbs to handle and the one which is most certain to give the best results with the least care and labor.

What I think I have found out after playing with them for about twenty-five years is that they need about seven months of growing time and about five months to rest. What I mean by growing time is that they should be kept growing and not standing around, neither growing or resting, and what I mean by resting is that they should be dried off completely without a drop of water while they are dormant.

The bulbs in my collection, which numbers about one hundred and thirty, are at this time (January 15th) dormant and are in pots under green house benches where they were placed last October. They will at any time now begin to show the flower stalks coming up. This will continue along for about a month before they all get started. As soon as the spathes appear I put them on top of the benches and keep them well watered and they make rapid growth and within a few weeks are in full bloom. This arrangement gives a long blooming season, from about March 1st to May.

About May 1st when all danger of frost is over and they are through blooming, I plunge them, pots and all outside in cold frames and pack soil or cinders around them up to the top of the pots. The cold frames are in full sun with good circulation of air all around them. When it doesn't rain they are thoroughly watered all through the summer. They need but little or no feeding but do need water all the time they are growing.

They remain in those cold frames until there is danger of frost—about October 1st here. They are then taken inside and dried off by withholding all water. It takes about three weeks to do this properly. They are then again put under green house benches to await the time for the next blooming. This completes the circle.

HYBRID NERINE—MINERVA

WYNDHAM HAYWARD, *Florida*

The hybrid nerine, *Minerva*, which is shown in the illustration, Plate 82, is one of the fine types of this charming group of plants which have been developed largely in England. The old English bulb firm of Barr & Sons has specialized in their culture for years. The color is a pleasing and unusual rich scarlet with minute overcast of glistening gold on the petals. The umbel when fully expanded is very showy. The culture of this variety is the same as that recommended for *Nerine Fothergilli major* and other well known varieties. It seems more vigorous and thrifty than many of the nerines and their hybrids, and may become an important horticultural specialty when increased stocks are available.

CYRTANTHUS AS A HOUSE PLANT

JOHN F. RUCKMAN, *Pennsylvania*

How such a choice and easily handled bulb as *Cyrtanthus* can have been neglected so long is a mystery. The only trouble seems to be to get the bulbs in the first place. The bulbs are small and should be potted up singly in three inch pots in the soil mixture used for hybrid amaryllis with the upper quarter of the bulb above ground. They start into growth early in November and bloom during January and February. After blooming a strong growth should be encouraged until the foliage ripens, usually about the middle of June. From then until November they should be kept dry or nearly so, as with other deciduous amaryllids in their dormant state. They form offsets rather freely and these should be kept growing with the old bulb until the pot becomes badly crowded as is the practice with *Vallota*. Occasional waterings with liquid manure both before and after blooming are beneficial and a little of the old surface soil may be removed from the pots and replaced with fresh just before growth begins.

So far I have grown three kinds. One, probably *C. parviflorus*, has not bloomed for me as yet but I have had it only a few months. *C. McKenii* bears an umbel of six narrowly tubular blossoms one and seven eighths inches long on 11½ inch stems. The flowers are a soft ivory white and have a faint perfume resembling that of *Amaryllis belladonna*. Unlike most *Cyrtanthus* the blossoms do not droop but are held in a horizontal position.

Another *Cyrtanthus* whose name I do not know is, with the exception of *Zephyranthes carinata* and *Sprekelia*, quite the showiest small amaryllid I have seen. Its blossoms are much the shape and nearly the size of Freesias, borne in a characteristic drooping umbel of five or six on a 9½ inch stem. The color is an indescribably beautiful shade of glowing coral red, possibly the "sunrise color" ascribed to *C. sanguineus*; however its shape is not at all like *C. sanguineus* as illustrated on page 134 of the 1936 Year Book having much more the appearance, on a smaller scale, of *Clivia cyrtanthiflora*. The blossoms last a full two weeks in good condition and the foliage being short and rather stiff it is a good looking plant at all times. Easier to handle and much more permanent than most of the commonly grown winter forcing bulbs *Cyrtanthus* should become very popular once an adequate supply is available.

CYRTANTHUS

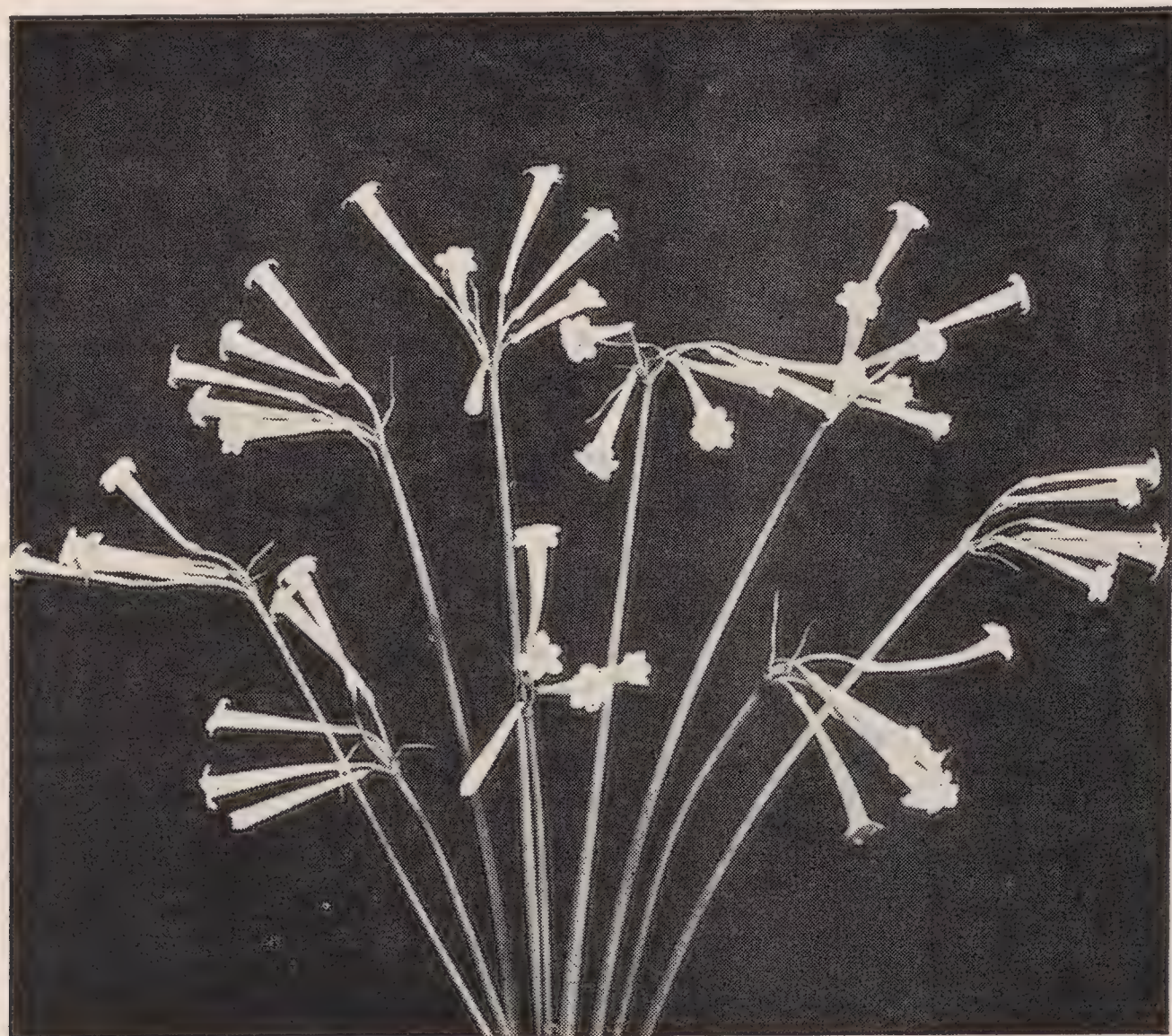
W. M. JAMES, *California*

This is a fairly large group (36 species), and the varied shape and colors of the flowers make it an interesting one.

C. lutescens has bright yellow, slightly funnel shaped (almost tubular) flowers which are 2 inches long with a short wide flare on the tip (See Fig. 30). They are borne in an umbel of 3-6 on a slender stem about 12 inches long. There are 4-6 bright green narrow leaves 10-12 inches long, persisting nearly all the year in Santa Barbara, especially

if they get a little water. The main flowering period is in early winter, but there are a few scattering flowers nearly all summer. A sandy loam is probably the best soil. It likes plenty of water and sun during the winter. Good drainage is absolutely essential. Although it will not stand many degrees of frost, it likes to be cool and probably should be kept at 40 to 50 degrees under glass. Present indications are that it will be desirable as a winter pot plant and fine out of doors in the milder climate. It is also useful for cutting.

C. Mackenii is very similar to *C. lutescens*, except that the flowers are a creamy white. The flower stems are a trifle thicker and straighter. The main flowering period is in late winter and early spring. Culture and use are as indicated for *C. lutescens*.



W. M. James

Fig. 30 *Cyrtanthus lutescens*

C. parvifolius has a small, bright red flower. Except for the color, it is doubtful if it deserves much attention. It may possibly be useful for hybridizing, I have also had *C. O'Brienii* and could see very little difference between it and *C. parvifolius* except that the flower is little different shade of red. Both bloom in early spring and require the same culture as *C. lutescens*.

C. obliquus is more showy than those already mentioned, although the flowers appear before the foliage is fully grown. It is not doing as well as it should. It seems to require a definite, dry, rest period and may have to be lifted and stored during the fall and winter. The flowers are more or less tubular, red with a yellowish base, 2-3 inches long and are borne in an umbel of 10-12 on a stem 1-2 feet long. The leaves are 1-2 inches broad, 1½ to 2 feet long and have a twist of one to two turns in



Wyndham Hayward

See page 236

Nothoscordum bivalve



Wyndham Hayward

See page 228

Hybrid Nerine—Minerva

Plate 82

their length. Flowers appear in spring. This plant is apparently very desirable, but I haven't yet determined the best method of culture.

There are other species and some named hybrids. I have seedlings of *C. angustifolius* and *C. sanguineus*. Their descriptions sound interesting, and I am anticipating the first flowers with pleasure. Most of the seeds imported have been badly mixed and even yet I am not absolutely sure that I have all my plants correctly named. Apparently some of the species cross-pollinate very readily, making it difficult to name some of the seedlings from imported seed when we are not familiar with all of the species. My experience with *Cyrtanthus* has been interesting, and I think it will be a desirable addition to our list of useful plants.

NERINE CULTURE

W. M. JAMES, *California*

When we consider that some of the better *Nerine* species were introduced to cultivation as long ago as 300 years, it is astounding that they are not more widely known at the present time. *N. sarniensis* has been so widely cultivated in the Channel Islands for some 200 years that it has acquired the name Guernsey Lily. They are grown rather extensively in England at the present time and the English have developed many fine hybrids. Outside of a few private collections, they are practically unknown in the United States. Bulbs offered here in fairly large quantities as *Nerine sarniensis* have mostly proven to be *Lycoris radiata*.

Very few of the known species are obtainable, even in their natural habitat in South Africa, and I will mention only a few of the hybrids. Descriptions of these will be found in catalogues and garden magazines as soon as the bulbs are available in sufficient quantities to supply the market.

Nerine filifolia is an evergreen with grasslike leaves and was described in the 1936 Year Book. It is hardier than the others and was not injured by the "freeze" we had this last winter. The first crosses to flower with this as a maternal parent indicate that it will pass on its free flowering habit and rapid increase of bulbs.

Nerine Bowdeni has a large pink flower and blooms with the foliage (See Plate 83). It would probably be evergreen in a warm enough climate. The leaves generally die down early in February and start again in June. This year the foliage was frosted in January and started again early in March. It is one of the hardiest and can be grown out of doors in the South and West of England. It propagates more rapidly than any of the others I have grown except *N. filifolia*. Two recent English hybrids with *N. Bowdeni* as one parent—*Aurora* and *Hera*—have the foliage with the flowers and seem to be about as hardy as it is. All three flower in September and October. *Hera* (See Plate 84) and *Aurora* have extra large pink flowers on long stems and are very fine appearing. I understand all the others flower before the foliage, although there are some species in the eastern part of South Africa that I know very little about. They flower from September to the last of November, and with most of them the foliage starts about the time the flower is nicely open. The main growth takes place during the winter months and

the foliage generally dies the last of April or first of May. They are quite tender and can be grown out of doors only in the mildest climates. *N. corusca major*, a variety of *N. sarniensis*, (See Plate 83) and *N. Fothergilli major* are two of the best reds in this group. There are thirty or forty named hybrids listed by English dealers. One striking characteristic of all the nerine flowers is the way they glisten in sunlight. The red shades look as if they had been sprinkled with gold dust and the pink shades with silver dust. The more that I see of them, the more I wonder why it has taken so long to get them into cultivation in this country.

The hybrid nerine *Ingens*, with deep salmon-pink flowers is shown in Plate 84.

The cultivation in general is very simple. They like the full sun, a medium loam with plenty of humus, and good drainage. In planting, the bulb should be covered to the neck only. They are rather exacting as to temperature requirements and must not be planted where it is too cold; neither will they stand too much heat.

They do very nicely under glass providing they get enough light and the temperature is 50 to 60 degrees F. They can be grown in the same pots for several years. The English recommend crowding pot plants a little. My experience with them in the field indicates that they will do as well or better if not crowded too much. Each year it is best to remove an inch or so of dirt from the pots and the offsets from the bulbs just before growth starts and add fresh top soil. Water should be given sparingly as soon as growth starts, plentifully while the leaves last, and gradually withdrawn when they start to die. After the foliage dies the pots should be kept dry until growth starts again. The English recommend that the roots be disturbed as little as possible and that the pots be kept on their sides and placed next to the glass while the plant is dormant. I think placing them next to the glass would "bake" them a little too much in most sections of the United States.

My experience in growing them in the field conflicts a little with the methods the English recommend. Because it is difficult to dry the soil out properly during the rest period, I always dig them as soon as they go dormant and store them under the same conditions as other bulbous plants. Naturally the digging more or less injures and breaks the roots and storage in dry air dries them out somewhat, but it does not seem to effect the way the bulbs grow and flower. When digging them, I have noticed that new roots have grown and that the old ones which were on the bulb when it was planted are all dead. If the old roots are not necessary it would be easier to handle the bulbs if the roots could be cut off when they are dug. As the bulbs become more widely distinguished, the experience of growers in different localities will help to determine the best method to use in growing and handling them.

WILLIAM HERBERT ON PLANT MARKERS ¹

Zinc is the only fit ingredient for labels whether to be used in the open ground or in pots. A sheet of zinc is easily cut by the gardener

¹ "Amaryllidaceae," 1837, page 411.

with strong scissors into labels of whatever size he may want. If the zinc is greasy, the labels should be steeped for a minute or two in diluted nitric acid. The following recipe for making ink for writing on the zinc was communicated to me by a gentleman who was in the habit of using it, and I have found it indelible. Take Verdigris in powder 3i. Sal Ammoniac ditto 3i. Lampblack 3fs. Water 3x. Mix carefully in a mortar. Keep the ink in a bottle well corked. It must be well shaken before the pen is dipped in it.

HIPPEASTRUM RUTILUM VAR. CROCATUM

FRANK VASKU, *Florida*

Our two bulbs of *H. rutilum* var. *crocatum* (See Plate 80) bloomed in time to be placed in the National Show held in Orlando in April 1936. Up to that time they were grown in a damp shady place, largely muck, along with other amaryllis. At the show they received a first class certificate as a species. As it seemed that this species is quite rare, we purchased more bulbs. We have found since that they are fairly common, in Orange County at least, but that they are often confused with the common *H. equestre* var. *major* and referred to by owners as "the common amaryllis."

This past year I gave the bulbs better care hoping to get some offsets and to carry them through the blooming period in better shape than I did last year. Ten of the bulbs flowered. From this limited experience I believe I am safe in making these deductions.

1. All of them are deciduous, or almost so. If they do have a leaf or two when they begin blooming, these die down before the plant gets through bloom.

2. There is quite a variation in size and coloring of flowers. Out of the ten bulbs blooming this spring, one was a beautiful delicate peach color, somewhat smaller than the rest, another was larger, coarser, with more red than our original ones and lacking in grace. Of course it is possible that these variations are due to cross pollination.

3. They all have one fault in common—They bloom themselves to death. They seem to put all their vitality and strength into the flower so that they have no strength left for making offsets. I have not tried propagation by cuttage as yet. They set seeds very readily but it is too early to say how true they come from seed.

NOTHOSCORDUM BIVALVE

WYNDHAM HAYWARD, *Florida*

The interesting little bulb known as *Northoscordum bivalve*, formerly spaced under *Allium* by some botanists, and closely related to the "onions," is widely distributed in nature in the South and midwest of the United States. It grows in rather moist, heavy soils, and adapts itself well to pot culture, blooming in the spring in Florida.

As might be expected from its wide range in habitat, there are found numerous varietal differences in the species, some with wider foliage and

larger flowers. The specimen shown in the illustration, Plate 81, was collected along the roadside near Lake City, Florida, where it was growing in a heavy clay soil in conjunction with bulbs of *Zephyranthes Treatiae*. The individual flowers are dainty and starlike, and have a delicate and pleasing fragrance.

THE USE OF LYCORIS AUREA IN THE LANDSCAPE

JOHN R. HEIST, *Florida*

Within its range, which has not been determined, *Lycoris aurea* has proved to be a most worth while and easily managed plant for naturalizing in the landscape.

Bloom and foliage is produced in late August or early September. The foliage grows until early June in full sun and a month longer in cool shady places. There is a period of about three weeks at this time that the ripening foliage is rather unsightly. For this reason it has proven more desirable for use when naturalized with other plants as shown in the illustration, Plate 85.

If left undisturbed it will make fine clumps showing a dozen or more bloom stalks. The golden yellow nerine-like flowers against the green of a border of shrubs or foliage plants is a sight to arrest the attention of every passerby.

LYCORIS SQUAMIGERA AND AUREA

E. O. ORPET, *California*

Since the days in New England, we have always been interested in the one amaryllid hardy there, then known as *Amaryllis Hallii*. This was introduced to Rhode Island by Hall with many other interesting plants from Japan, and for years this bulb, now recognised as *Lycoris squamigera*, was very scarce and highly valued in gardens. The original introduction seems to be the best form. There is a distinct bluish shade in the open flower and the name, "Blue Amaryllis", has sometimes been used.

We here have become possessed of another form with narrower foliage and much narrower petals to the flowers. Until recently, this was considered the same as the original introduction. We have been enabled to make comparisons and even now are not sure where our form originated, but probably from Japan as lycoris are commonly exported in quantity. Certain it is that the *Lycoris squamigera*, usually sold and grown in large numbers in the East and the Middle West, is the better one. We have never seen a tendency to seed production here on either one of the two kinds even with hand pollination. Both seem self-sterile which is usually suggestive of hybrid origin in other plants.

The one other species of this Genus—*Lycoris aurea*—is a total failure here. From an importation of 600 bulbs we have not one remaining. This is partly due perhaps to the "Fly," but more so to lack of warmth in our winter growing season. I am told this species does well in Florida. It is a glorious yellow when happy, but we have failed with it here.

In eastern gardens, we found that the bulbs of *L. aurea* were dormant in winter, flowered in autumn and make foliage with the spring weather and remained dormant throughout the summer.

AGAPANTHUS UMBELLATUS

MRS. W. E. MACARTHUR, *Florida*

Mrs. W. E. MacArthur

Fig. 31. *Agapanthus umbellatus*

for out-door planting as they are hardy in this area and are free from insects. There are both tall and dwarf varieties.

Agapanthus are apparently still rare. The white variety is lovely beyond description and suitable for a bridal bouquet.

The Blue Lily of the Nile, which does not come from the region of the Nile but from South Africa, is a splendid decorative plant that should be freely planted in Florida gardens.

My plant, which must be three or four years of age, is in bloom for the first time bearing an umbel of ninety-two hyacinth blue perfect lilies and buds on a scape over three feet in height. (See Fig. 31). It continues to bloom over a long period of time because the flower buds unfold daily from the center of umbel. The straplike foliage is attractive and evergreen. The roots are hard to control and often grow out of the soil. They have bursted the pot in which they are growing.

Agapanthus makes a desirable pot plant for conservatories and

THE MINIATURE HIPPEASTRUMS

WYNDHAM HAYWARD, *Florida*

The pink and red varieties of *Hippeastrum advenum* which are illustrated in this issue of *Herbertia*, Plates 86 and 87, are interesting bulbs for naturalizing in the Southern gardens. In habit they are similar to *Lycoris* and *Nerines*.

The red variety has been identified as *Hippeastrum advenum* var. *miniatum*, and the pink variety may be another variation of the same species. They are described in an article on page 133 of the 1935 *Herbertia* by Dr. C. W. Hall. They were introduced to the United States by Peter Oberwetter, pioneer amaryllid enthusiast of Texas. They are quite common in old gardens around Austin, Texas.

The pink variety makes a larger bulb in some cases than the red. The red variety has been termed the "Ox-Blood Lily" because of its distinctive coloring. The blooms come in the late summer as a surprise

when no leaves are showing, usually after a heavy rain. In a partly shaded place the stems will rise a foot and a half in height. The pink variety seeds readily and the red one sometimes. It would seem to require several years to grow blooming size bulbs from seeds, as they are very slow in growing and dormant all the summer months from May to October.

The culture is easy, as they require only fairly deep planting in a light, medium rich, well-drained loamy soil. Light frosts do not injure the foliage.

HIPPEASTRUM PRATENSE

W. M. JAMES, *California*

Four years ago Mr. Orpet, of Santa Barbara, had an exceptionally pretty flower show up in a corner in his garden. All record of what it was and where it came from had been lost. No one who saw it could identify it, and the flower was too valuable for seed to pick. He gave me the seed and I was fortunate enough to raise a few plants. The original plant died before flowering again. In the meantime a visitor told about seeing a red flower at the Chelsea Show. That was a definite clue, and the description was finally located in Baker's *Amaryllideae*, which I quote.

Bulb ovoid, $1\frac{1}{4}$ - $1\frac{1}{2}$ in. diameter; neck short; tunics brown. Leaves linear, contemporary with the flowers in spring, $1-1\frac{1}{2}$ ft. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. broad. Peduncle moderately stout, 1-2 ft. long. Umbel 2-4 flowered; spathe-valves lanceolate, 2 in. long; pedicels $1-1\frac{1}{2}$ in. long. Flowers bright red, ascending or horizontal; tube very short, appendiculate at the throat with minute linear scales; segments $2\frac{1}{2}$ in. long, oblanceolate, $\frac{1}{2}$ in. broad above the middle, subobtus. Stamens declinate, more than half as long as the limb; anthers linear-oblong. Style declinate, as long as the limb; stigma capitate.

This bright orange-scarlet flower with a golden throat must be seen to be appreciated. It will be especially effective in masses. So far I know very little about its hardiness. English growers advise that it is hardy there if planted 5 to 6 in. deep in a sunny location. So probably it can be used out of doors in this country only in the milder sections. It is doing nicely here and generally flowers in April. It grows easily from seed and the bulbs increase fairly well. The stems are long enough, and it keeps well as a cut flower. It should prove a very welcome addition to our spring flowering bulbs.



W. M. James

See page 233

Nerine Bowdeni, UPPER; *Nerine corusca major*, LOWER

Plate 83



W. M. James

Hybrid Nerines, Hera, LEFT; and Ingens, RIGHT

See pages 233 and 234

AMARYLLIS CULTURE BY AN AMATEUR

E. N. BLAKE, *Texas*

First I wish to say that these observations are for the extreme south and they will have to be somewhat modified for colder regions. They are given in order to encourage the wider use of amaryllis in the gardens of the South.

My experience has been that fresh seed are the first requisite. Secure seeds from the current year's bloom and plant within three months after ripening. Prepare the beds by spading and then soak thoroughly, and when dried out so that they can be worked with a rake, pulverize the surface and open furrows about one inch apart and space the seed one inch apart in the furrow and cover lightly. Then give the bed a good wetting and cover with a slat screen to make a three-quarter shade. Keep the beds moist by watering through the screen. The plants should come up in about two weeks. Keep them growing where they are through the winter, but remove the shade when the weather gets cool, but keep the screen handy for a cover in case of a frost. If the leaves should freeze do not be uneasy as new ones will come out again unless the ground freezes too deeply.

In the spring transplant the seedlings to new beds and space them about four inches apart in rows about one foot apart where they can remain until they begin blooming which will be, as a rule, at the end of at least two years. If you wish to force a few into blooming earlier than that put some in pots so that they can be given more warmth.

Do not try to select your best plants until they have bloomed as you can not tell the best by the size of the growth they make, some of the largest flowers will come from the small or medium sized bulbs. When they have bloomed you will be able to decide which ones you want to keep. Take these and plant out in rows about eighteen inches apart and at least one foot apart in the row. They can be left here for two or three years if they do not multiply too much, in which case it will be better to thin them out again. If grown as closely together as indicated above, they will need lots of fertilizer and plenty of water.

The illustrations, Plate 88, show, *upper*, a clump of *Johnsonii* left undisturbed for eight years; forty-five flower scapes are shown, many of them with five or six flowers; *lower*, a group of two year old seedlings coming into bloom for the first time.

FLOWERING LEUCOCORYNE IXIOIDES ODORATA IN TWO YEARS
FROM SEEDSW. M. JAMES, *California*

Experience gained over a period of years from growing several pounds of *Leucocoryne ixioides odorata* seeds indicates that only a very few plants bloom before the seedlings are 3 years old and that they go down below the ground surface 10 to 15 inches deep when planted in ordinary garden soil.



W. M. James

Fig. 32. Two year *Leucocoryne* seedlings

In the fall of 1935 two beds separately prepared with a rich mixture of different kinds of fertilizer and oak leaf compost were planted with seeds harvested the previous spring. A control bed was planted in unprepared soil at the same time. During the winter of 1936-37 two light applications of Amo-phos (11-48) were given all three beds, one soon after the leaves appeared and one just before the flowers opened. They are shown in the foreground of the illustration (Fig. 32). It shows very clearly the better results obtained in the prepared beds.

The leaves in all three beds were literally as thick as grass in a lawn. The control bed on the right had scarcely any flowers, while they were actually piled up in the center bed.

Very few of the bulbs in the control bed were over $\frac{3}{8}$ inch in diameter and were in the ground 10 to 15 inches deep. In the other beds most of the bulbs were over $\frac{3}{8}$ inch, with possibly 50 per cent of

them $\frac{1}{2}$ to $\frac{5}{8}$ inch, in diameter. Quite a few were up to 1 inch in diameter. Only a few of them were in the ground as deep as 15 inches and probably 50 per cent were less than 6 inches deep. Occasionally there was a large bulb only 2 inches below the ground surface. In 3-year old beds formerly raised, I have never found the bulbs over $\frac{5}{8}$ inch in diameter and more than 50 per cent were under $\frac{1}{2}$ inch and nearly all were 10 or more inches below the ground surface.

The bulbs from the prepared beds were as firm and nice looking as any I have ever seen. The largest bulbs in the top 3 inches of soils were separated when dug, and all the seeds from the 2 year old bulbs was separated from that of the older bulbs this year, in the hope that an earlier flowering, shallower growing strain might be developed.

AMARYLLIS NUTRITION PROBLEMS

JOHN R. SPRINGER, *Florida*

The apparently unresponsive nature of amaryllis bulbs (hybrid *Hippeastrums*) to various fertilization treatments under intensive lath-house culture, has been shown by an experiment undertaken during the growing season of 1935-36 near Orlando, Fla.

The bulbs used in the experiment were various mixed hybrids of the Mead strain, sorted into grades by size of the bulbs. They were under the minimum commercial size for a blooming size bulb ($2\frac{1}{2}$ inches diameter) and it was the purpose of the test to determine if possible what type of treatment would produce the greatest possible increase in size in the season's growth.

The bulbs were planted in beds in the lath-house between November 15 and December 15, 1935. The planting soil was the usual medium grade of Norfolk Fine Sand, which had been in active cultivation over a period of eight years but had been built up repeatedly during that time by the addition of organic roughage, manures, tankage, peat, leaf mold, etc. The bulbs were given adequate water by overhead irrigation when necessary during the experiment.

The beds are in approximate half shade, and the bulbs were planted in rows 12 inches apart, the individual bulbs four inches apart in the row. There were approximately 2,500 bulbs to each bed, and they were weeded and fertilized by hand entirely.

The fertilizer was applied to the beds in three equal applications, about February 1, May 1, and July 1, 1936. It was worked in by hand. The beds run north and south, and the north half of each bed was fertilized with organic materials only, the mixture being composed of $\frac{1}{2}$ high grade tankage, and $\frac{1}{2}$ ground tobacco stems. The south half of each bed was fertilized with inorganic materials exclusively, composed of nitrate of soda, sulphate of ammonia, super-phosphate, kainit, in the proportion of 4-5-5 (N-P-K).

In all there were four beds, and the bulbs were planted in them as follows: *Bed No. 1*—bulbs from $\frac{3}{4}$ " to $1\frac{1}{4}$ " in diameter; this bed received fertilizer throughout at the equivalent rate of 1,000 lbs. to the acre. This applied equally to the inorganic and organic materials.

Bed No. 2—bulbs from $1\frac{1}{4}$ " to $1\frac{3}{4}$ " in diameter; received fertilizer materials at the equivalent rate of 2,000 lbs. per acre. *Bed No. 3*—bulbs from $1\frac{3}{4}$ " to $2\frac{1}{4}$ " in diameter; received the equivalent of 3,000 lbs. of fertilizer to the acre. *Bed No. 4*—bulbs just short of $2\frac{1}{2}$ " in diameter or commercial minimum size; received the equivalent of 4,000 lbs. of fertilizer to the acre.

All the bulbs were dug and sized about November 1st, 1936. There was practically no difference noted in the growth of bulbs in the same bed whether they had received the organic or inorganic fertilizer materials. The foliage on the half beds which received the organic materials was uniformly greener.

The bulbs on the entire four beds were found to have made a remarkably uniform increase in size, regardless of the quantity of the fertilizer materials applied to them during the experiment, and without reference as noted above, to the type of fertilizer materials used (organic or inorganic). The average increase of the bulbs was about $\frac{3}{4}$ inch per bulb in diameter for the growing season.

The writer presents these results with the feeling that while they are largely negative, they may be useful to other investigators in the important problem of commercial hybrid amaryllis culture. They will, it is hoped, help to point the way to further experiments of a similar nature along the same lines. It is realized, of course that a single year's results are not to be considered as conclusive in any way, as it is possible that weather, including temperatures, rainfalls, etc., and residually fertilizing elements in the soil may have influenced the results.

AMARYLLIS BELLADONNA

E. O. ORPET, *California*

For many years the Belladonna Lily, *Amaryllis belladonna* has been known and commonly grown, so much so that it is very much in the discard here. It thrives with no care, multiplies too rapidly and seeds freely. This is the supposedly original pink which seemed to be the type. We were much surprised to learn from Miss Stanford on her recent visit here at the time of flowering, that our kind was considered rare with her in South Africa, and that all those growing in her neighborhood were white and rarely pink tinged unless grown in the shade. Here is another puzzle in plant distribution. So much for the "type" as we know it here.

Some time ago a bulb of the white *Amaryllis belladonna* was brought in, distributed in a small way from offsets which was necessarily slow. However, seeds were produced and bulbs raised, which have not yet to our knowledge reached flowering age. Later, the source of these white forms was discovered to be in Australia, and more were introduced. The one we have flowered is called *A. belladonna multiflora alba*, and the plant when in bloom is well described by the name. There are from twenty to thirty flowers on each stem, pure white with a yellow center, and the succession of bloom lasts a long time. Another form, *A. belladonna Hathor*, is said to be the best. There are still others including

A. multiflora Harbord; some of these are white flowered and others are shaded pink. We are mostly interested in the white kinds here in California.

There is evidence of hybridity in all the above kinds. The very many flowered umbels do not obtain in the type as we know it and the question is, what did the Australians use to get these results? It would be interesting to know. Certain it is that they have been doing good work with this genus, and also with the watsonias. The series of watsonias sent here from Australia far surpass any of other origin that we know. The flowers are larger with better colors and the set we have had for years include the best to date. Some of the colors it is true are not desirable to some critics—"too much magenta" is the cry—but there are some who favor these, and we grow them. In a collection of varying shades in the garden there is harmony.

In returning to *Amaryllis bellanonna* it is of interest to note that there is no difficulty in importing them except that we have to change the season of growth. The bulbs arrive dormant and remain so through our summer, and only gradually become adapted to growing in our autumn. It takes about two years to acclimate such imported bulbs. We hope in another year to be able to report on more than this one variety, *A belladonna multiflora alba*, that has flowered in California for many years past.

DAYLILIES IN NEW YORK AND FLORIDA

JOHN V. WATKINS, *Assistant Horticulturist,*
College of Agriculture, University of Florida

A *Hemerocallis* enthusiast who visits the daylily plantings at the New York Botanical Garden is immediately and breath-takingly impressed with the scope of the work being done there with this responsive group of *Liliaceous* plants. Under the able direction of Dr. A. B. Stout, Director of Laboratories, the selective breeding of daylilies has been carried to remarkable lengths.

One of the most interesting groups to a Southern horticulturist, is the large collection of seedlings that contain the blood of *Hemerocallis multiflora*. These plants are characterized by wiry stems, small flowers that are borne in great profusion and lateness of flowering that has particular value in Florida. There is no doubt that a race of daylilies that will bloom for us in late October and in November will be developed to an unprecedented state of perfection by selection and breeding. One of the very attractive Stout hybrids of "multiflora" lineage bears numerous small flowers that resemble clear, butter-yellow freesias. These late autumn bloomers should be welcomed by the landscape designers and nurserymen who work in Florida tourist centers.

A Florida *Hemorocallis* enthusiast notices, upon close inspection of the individual clones, that there are differences in behavior between certain of the "fulvous" sorts growing in New York as compared with the same clone in peninsular Florida.

For instance, the old familiar fulvous daylily, *H. fulva*, known as Clone *Europa*, is the botanical type of the species. In the New York Botanical Garden, plants of this clone from the four corners of the world grow together and behave identically with their neighbors. There is not a trace of difference. Yet in Florida, plants of this clone, *Europa*, have distinctly shorter scapes, are much less robust, have less tendency to stool out into larger clumps. Several years' records show that in Gainesville, *Europa* scapes are a foot to a foot-and-a-half shorter than those growing in New York City and on Long Island. The well known variety *Bay State* is a semi-dwarf plant in Gainesville, sending its scapes to a height of twenty inches. In the New York Botanical Garden, *Bay State* scapes attain a height of 38 inches. There is a little hybrid that we like so well at the University that we call it *Brownie* and have known it for five or six years as a dwarf plant of distinct charm. In Dr. Stout's Collection *Brownie* bears its small dark brown flowers on scapes 34 inches above the ground! As a tall plant in the East its flowers are too small and dark for its stature, as a dwarf in Florida, *Brownie* has decided merit for certain uses.

Margaret Perry grows taller in the East than it does in peninsular Florida, as does *Kwanso*, the double flowered variety. *Cissy Guiseppi* is much smaller, much less at home in Florida than in New York.

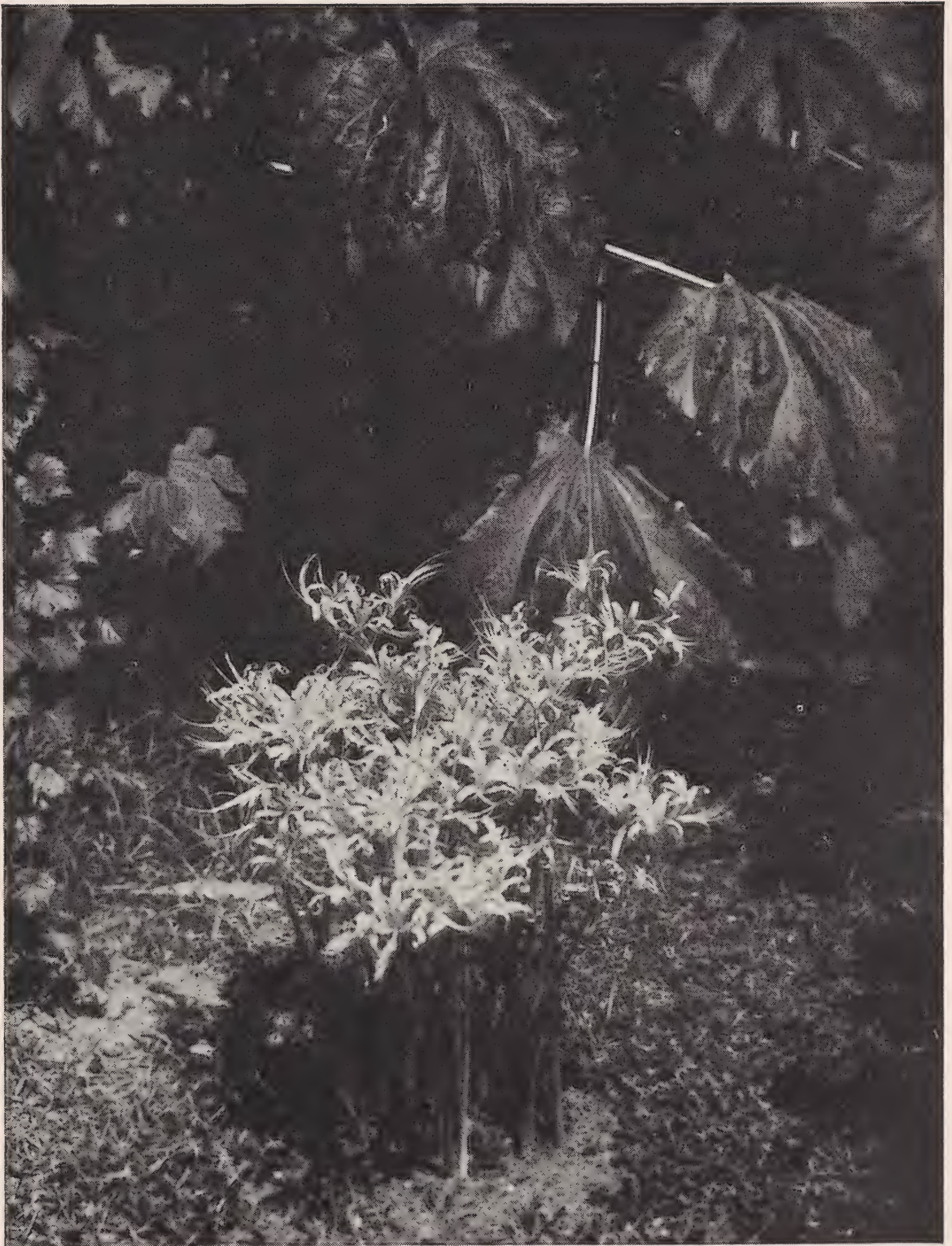
The plants in the Gainesville collection that belong botanically to section *Dihemera*, such as *H. Dumortierii*, *H. Middendorffii* and their hybrids, are, for the most part, of little potential value to Florida gardeners. They are deciduous and their scapes are too short under our conditions to be capable of much show.

Our records show only an inch or two or three difference in stature for most of the 105 named varieties in the University collection as compared with Dr. Stout's records. The clones mentioned here certainly behave differently, react differently in our climate. Why most of the named sorts do not show greater discrepancies and why these particular ones do, presents a very interesting problem. Culture is identical for all plants in the University collection, none of them ever lack water or plant food, so we can be sure that they are not starved into their lesser statures.

During an unprecedented hot spell in New York last July, it was noted that the foliage on "fulvous" daylilies was injured much more seriously than were the leaves of many yellow-flowered clones. We have never noticed sun-scald on any *Hemerocallis* foliage in Florida, no matter how high the temperature.

Hemerocallis aurantiaca, if memory serves aright, seems much happier, grows much more lustily, produces flowers of better substance in Florida. It is an evergreen species that originally came from southern Japan and it seems to be one of our most excellent forms for Florida. Not always strictly hardy north of New York City, it is certainly at home in the lower South and is, without doubt, one of the best for mass planting.

In all fairness, it must be admitted that daylily blossoms are scalded by Florida's summer sun. All varieties definitely prefer after-



John R. Heist

See page 236

*Lycoris aurea naturalized in the garden of Mr. John R. Heist,
St. Augustine, Florida*



Wyndham Hayward

See page 237

Hippeastrum advenum—Pink

Plate 86

noon shade, the pale yellow sorts require it. In the New York Botanical Garden, the daylilies receive no shade and the flowers will go through most days without injury. The pale yellow varieties, the ones that have almost white perianths of very fine texture seem to have a great attraction for Dr. Stout and he is breeding and selecting with a view to the production of flowers that are extremely pale, but at the same time robust in petalage.

The long Florida growing season enables us to propagate salable stock from a single division much more quickly than can be done in the north. A given variety will grow a great many more divisions in twelve months in Florida than it will in New York and happily, we see no enervating tendency, no deterioration with the majority of clones.

As in Florida, the New York Botanical Garden daylilies, appear to have no serious diseases. In Florida there are no apparent insect pests that will prey upon *Hemerocallis*, but unfortunately, in the northern garden the unopened buds are badly injured by Japanese beetles toward the later part of July, and, as a result, the flowers are malformed.

It is a never ending thrill to see the same daylilies thriving on Long Island, in New York City, in South Carolina, in North Florida and in the Everglades. Truly this remarkable genus of plants exhibits a cosmopolitanism that is surpassed by few garden flowers that we know.

LESSER NARCISSUS FLY CONTROL

W. M. JAMES, *California*

For several years I tried various methods in attempting to control Lesser Narcissus Fly with little or no success. They were especially bad on *Cyrtanthus* ssp. and *Vallota purpurea*. Study of all the literature available indicated that the fly preferred to deposit the eggs just where the leaves come out of the ground, especially if there were a few dead ones lying on the ground at that point. Then the thought occurred to me that the fly might not go down through a dense ground cover to deposit the eggs.

Dwarf Alyssum was tried because the seeds are not expensive, it grows quickly, is easy to control and will not choke the bulbous plants. It was planted so that the flowering plants completely covered the ground. A thorough trial with some ten different kinds of bulbous plants indicates this to be a very satisfactory control. Bulbs formerly alive with maggots when dug have shown no infestation at all for two years.

I do not think it is accidental and will be very interested in hearing if any one else can get similar results.

DAYLILIES—DEPENDABLE PERENNIALS

MRS. W. E. MACARTHUR, *Florida*

A well known writer says that "God gave us memories that we might have roses in December" and through this gift of memory I am enabled to enter the gate of my grandmother's garden that has long since passed from the face of the earth and see perfectly my first day-lilies—tawny daylilies that always seem to hold a fat bumble bee powdering himself with gold dust and the Lemon Lilies of wonderful color whose golden chalices of indescribable fragrance that lured the lovely iridescent humming bird many times a day for a feast of honied nectar.

These lilies I know now as *Hemerocallis fulva* and *Hemerocallis flava* and since the latter has advanced so much in style and form, I like to keep the Lemon Lily by its old name in my memory.

I have seen *Hemerocallis fulva* parading as wildlings by the roadsides in Ohio; as squatters on old abandoned homesteads in North Carolina, and as sentinels clustered about a cabin door high on a hillside in Kentucky and I felt that the hands that had carried, nourished and loved them had ceased from all toil and had left these rugged, persistent individuals to silently gladden the earth.

These dependable perennials have no rival as attractive garden plants for this area. They are easy to care for and increase into effective designs quickly and with the ever increasing work of plant breeding in developing color, size and form; its value as a landscape subject for the South is practically unlimited.

The recent discovery of the crown cuttage vegetative propagation method will aid very materially in increasing the recent hybrid creations.

This area has a creditable collection of some of the most sought after hybrids and some of our enterprising nurserymen have already produced some outstanding seedlings that are worthy of a name. However, with the ever increasing desire to create new forms and colors there will be a confusion of names such as now puzzles the camellia enthusiast.

There is a very fine hemerocallis in this section that has not been classified as to name,—the blooms are large amaryllis-like flowers of deep orange color, the texture is of heavy substance and glistens with a coating of gold dust; it begins to bloom in early April on a tall scape bearing four to five buds; it rarely develops seed pods but it does produce a fair percentage of proliferations on scapes that are easily rooted in sand if removed before the scape dies down.

This variety is known locally as *Lila White* because it was found in a collection of daylilies purchased by Miss White from the Glen St. Mary Nurseries, in Florida many years ago and its real name is unknown.

Chrome Orange, introduced by the late Theodore L. Mead, is one of the loveliest of medium sized daylilies and is a good bloomer. Mr. Burbank's *Calypso* is a treasure—even though a night bloomer, it carries over well into the next day. *Citrina* is another night bloomer that gives fragrance to moonlit gardens and is quite desirable.

The rare, gorgeous new hybrids produced by the plant breeders of Europe and America are legion and daylily admirers are collecting them for their own as quickly as means and time will permit.

ACIDULATED FERTILIZERS *

W. T. McGeorge, agricultural chemist, Arizona Experiment Station, writing in the California Citrograph (August) on "Acidulated Fertilizers for Alkaline Soils," reports that investigations at the University of California and more recently at the Arizona Experiment Station "emphasize the adverse influence of high pH values (alkalinity) on the normally balanced absorption of ions by crops. When salts under the influence of water separate into their component parts or ions, the ions carry either negative or positive charges of electricity. At high pH values, or in the presence of residually alkaline fertilizers in alkaline soils, the plant has considerable difficulty in absorbing sufficient of the negatively charged ions (nitrate, phosphate, sulphate) while at low pH values, and in the presence of residually acid fertilizers in acid soils, the plant experiences difficulty in absorbing sufficient of the positively charged ions (calcium, potassium, magnesium). A number of physiological disturbances are manifested by crops grown on alkaline soils and among these the several forms of chlorosis are most common. There is considerable evidence that these disturbances are fundamentally caused by small amounts of alkali in the soil. . . It is true that most of the physiological disturbances noted on these slightly alkaline soils respond favorably to dusting or spraying with salts of zinc, iron, manganese or copper, but it is equally true that the solubility of all these elements in the soil solution is reduced to a minimum by high pH values (alkalinity) and their absorption by the roots is thus reduced to a minimum. These facts are offered as evidence that a high soil pH is fundamentally associated with the major disturbances in crops of the southwest. Reasoning along this line, short growing crops should be least disturbed by these soil conditions and long growing crops such as fruit trees most affected, and this is confirmed by field observations. It is our experience that even the small amount of alkalinity arising from calcium carbonate or caliche in soils will often be manifested by a serious plant disturbance. This should not only discourage the use of residually alkaline fertilizers on calcareous or alkaline soils, but is rather convincing evidence that fertilizers for such soils should be fortified with acidulated organic matter and/or small amounts of finely ground sulphur.

GROWING DAYLILIES ON MUCK

R. P. LORD, *Florida*

In 1934, my father, Professor E. L. Lord, noticed the peculiar behavior of a plant of *Flamid* in his garden at Gainesville. This plant had been placed in the lower end of a rock garden in 1932, when the level of the lake was five or six feet below normal. In the summer of 1933 the lake rose so that the water was about two inches deep over the crown. The following summer the original single plant had developed to a solid clump of fifty odd crowns. It exhibited great vigor and a pro-

* Daily Digest, (U. S. Dept. Agric.) Vol. LXII, July 25, 1936.

fusion of bloom. Due to the impression that several of the species of *Hemerocallis* were native to flood plains, the writer has for some time wondered about the adaptibility of daylilies to bog gardens.

In 1935 a number of plants were set out in the Cypress Gardens at Winter Haven on muck where the water table was within a few inches of the surface. Very vigorous plants were the result. This year the author moved his whole collection of daylilies to a similar piece of muck a few miles away. Due to the difficulties of moving 2000 plants 200 miles in spare time, several interesting incidents happened. A group of 100 plants, 2-year seedlings, were dug on April 18 and allowed to dry out completely. On June 12 these plants were planted in muck and only one failed to grow vigorously. Thirty days later three of them were in bloom. Many, after planting, were later shifted while in bloom without the wilting of a single petal.

The author is completely satisfied that daylilies are very well adapted to muck or bog gardens. They make faster growth, larger clumps, have more continuous bloom and are more free from bleaching on unfertilized muck than on ordinary fertilized soils.

NEMATODE ON HEMEROCALLIS

WYNDHAM HAYWARD, *Florida*

The susceptibility of *Hemerocallis* to infestation by root-knot nematode, or eelworm, *Heterodera marioni*, is shown by the report from the Division of Nematology, Bureau of Plant Industry, United States Department of Agriculture, in a letter to the writer dated September 2, 1937. In this report Dr. G. Steiner, Principal Nematologist, states that the specimen of *Hemerocallis* hybrid which was sent in by the writer for examination on suspicion of infestation, "is indeed infested with the root knot nematode". The variety was Aureole, and was obtained from a nurseryman some time ago. Most varieties of *Hemerocallis* have previously seemed immune from infestation by root knot nematode, and this is apparently the first reported instance of *Hemerocallis* being infested by this pest. However, the literature has not been exhaustively searched and there may be earlier reported instances of nematode on *Hemerocallis*.



Wyndham Hayward

See page 237

Hippeastrum advenum—Ox-blood Red



E. N. Blake

See page 241

*Hybrid Amaryllis in the garden of Mr. E. N. Blake,
Laredo, Texas*

Plate 88

7. HARVESTING, STORAGE AND FORCING

A WINTER SHOW SEASON IN HOLLAND

JAN DE GRAAFF

It was my good fortune to be in Holland during part of the past winter and to see some of the weekly shows of forced bulbs that are held under the auspices of the General Bulbgrowers Association and its branches.

Already on November 16th Professor van Slogteren, the eminent Dutch scientist, exhibited two perfect flats of *Narcissus Barrii Brilliancy* in full flower. These bulbs were grown under protection, then dug on July second, and after a short period of drying stored at a temperature of 48 degrees till September 18th. They were then planted in flats and held at the same temperature (48 degrees) until October 22nd. On that date the flats were brought into the greenhouse and kept at a temperature of about 59 degrees and on November 16th the narcissi were in full flower.

While this is not the first time Professor van Slogteren has surprised the Dutch growers, it really can be said now that his system has been so perfected that commercial growers can attempt the same thing with little fear of failure.

The next week no further daffodils were shown but Messrs. van Tubergen brought a very fine exhibit of *Hippeastrum aulicum* and a group of *Naegelias* in full flower. The *Naegelias*, now also called *Smithianthas*, were especially beautiful. Several hybrids were shown including *Rose Queen*, lilac-pink, flushed with salmon inside; *Golden King*, golden yellow with lighter shade inside and *Orange King*, clear orange. It was indeed a great collection.

On November 30th, while a real North Sea storm raged outside with hail and snow, I saw in a friend's small greenhouse several pots of narcissus *Fortune* in perfect condition. It is hard to describe the charm of these small greenhouses that one finds all over the bulb district in Holland. They are of very simple construction, heated with an ordinary coal-stove or a very small central heating plant. They are of immense value to the industry. It is here that new varieties are tested, it is here that new forcing methods can be tried out and it is here that growers, dealers, and exporters gather on these raw wintry days when no outside work can be done, to discuss the bulb business and the world conditions in general.

A week later my own firm had a very nice exhibit of narcissus *Fortune* with from two to three flowers per bulb, all in perfect form and with excellent coloring. The sensation of the day was however narcissus *Scarlet Leader*, one of our hybrids which received an Award of Merit in 1931. *Scarlet Leader* has a pure white perianth and a deep blood-red cup and the flowers here shown, three weeks before Christmas, were as good as any I have seen growing out of doors.

On December 14th we showed again *Fortune* and *Scarlet Leader* as well as some very nice pots of *February Gold*, the well-known cycla-

mineus seedling. Other daffodils at the show were *Incomparabilis Marion*, and *Helios*; Poetaz *Extase* and *Early Perfection*.

The big Christmas show of forced bulbs opened on December 22nd, in Sassenheim, the center of narcissus culture in Holland. It was a really magnificent show, a great tribute to Dr. van Slogteren whose research has made it possible to enjoy the beauty of spring flowers in mid-winter.

Besides many good tulips and very fine hyacinths there were so many daffodils of all types that it was hard to believe that Christmas had not yet come. Again *Fortune* was outstanding but I noted also a very fine flat of *Texas*, the fine double Backhouse seedling. Other good daffodils were *Lady Moore*, *Mrs. Barclay*, *Orange Glow*, *Indian Chief* and *Village Beauty*. Poeticus *Edwina* was the only one of that class and very fine. *Francisca Drake* claimed the attention of everyone. This variety is already well-known in the United States. The fiery orange cup on a pure white perianth was so outstanding that I predict a very good future for this variety. Yellow Trumpet *Alasnam* was extra good, also Poetaz *St. Agnes*.

I will not mention all other varieties shown in Sassenheim, nor those shown at the weekly shows in Haarlem on January 7th. and following weeks. The past winter has demonstrated very clearly that many daffodils of all types can be forced into flower from the middle of December to the middle of January and that with methods within the reach of any florist or even private estates. That this will bring with it a completely new evaluation of the varieties commercially available is evident.

No longer will mere earliness be an important factor in the valuation of a daffodil, since specially treated late daffodils can be made to flower in mid-winter. I believe that more and more we will judge the commercial value of a daffodil by its form and substance and coloring, trusting to the precooling methods to make it into a first class forcing variety as well. And it is here that the thousands of small experiments, carried on by practically all bulbgrowers in Holland will be of such immense value.

That the successful experiments with precooled daffodils opens up avenues of research for other bulbous crops is evident. Already at Christmas my firm had pots with crocus and muscari *Heavenly Blue* in full flower. Already enormous quantities of bulbous iris are forced commercially to flower at Christmas or shortly after. I believe the time is not far distant when the same thing will be done with many other bulbs such as amaryllis hybrids and that in the near future we will be able to time all these crops for special occasions.

FORCING HYBRID AMARYLLIS WITHOUT DRAINAGE

WYNDHAM HAYWARD, *Florida*

The forcing of hybrid amaryllis bulbs (*Hippeastrum*) into bloom in pots, bowls or other containers without drainage has been found practical in both experimental and commercial test planting during the last two years. This procedure possibly will open a large new field for the use of the bulbs, particularly in home floriculture.

The first experiment of this nature, so far as the writer is aware, was made in 1936 by Mr. Frank L. Bates, of the Bates Art Industries, Chicago, Illinois, who reports that his firm potted up 100 blooming size bulbs of hybrid amaryllis in the spring, using common granulated peat moss as the potting medium. The containers were art pottery bowls, such as are sold for the growing of Paper White narcissus in pebbles with water.

Mr. Bates writes under date of February 25, 1937, "The use of peat moss seems to give very satisfactory results—the idea of handling amaryllis in this way was, I think, original with us, as it followed our usual manner of handling Paper Whites. We have really had very good luck with blooming hybrid amaryllis in this fashion, and while we have had some complaints from customers, that the bulbs did not bloom, investigation has shown that the person attempting to grow the bulb did not wait long enough for it to develop."

Mr. Bates' commercial practice was to offer the bulbs for sale in retail stores together with an ornamental pottery container and sufficient peat moss for the potting.

In January, 1937, the writer undertook to repeat Mr. Bates' experiment with appropriate controls potted in a soil medium with drainage. Six bulbs of 2½ inch size, usually considered as blooming size, were potted up in glass pots and tin cans, the glass pots having been furnished by Prof. Alex Laurie of Ohio State University for amaryllis root studies. The bulbs were firmly packed in the containers, all of which, except the controls, were made water tight at the bottom. The peat moss was firmed around the bulbs which were buried to about one-half of their height. The peat moss was watered moderately for several weeks, just enough moisture being added to keep the peat thoroughly damp, never soggy. At no time was water enough given to the plants to allow any moisture to spill out, if the pots were tipped on their sides. This factor is most important in growing bulbs by the non-drainage method—careful moisture control.

The bulbs started growth in about three weeks, making a uniformly good root growth. This could be observed through the sides of the glass containers. All of them except one, produced flowers and about half of the bulbs produced leaf growth with the bloom scapes.

The illustration (plate 89) shows two of the bulbs in the glass pots, and was taken at seven weeks after the first potting. One of the bulbs is blooming in practically normal fashion without leaves. The other is sending up its bloom scape and also leaves. The root growth of the two bulbs in the potting medium is plainly visible through the glass.



Wyndham Hayward

See page 257

Forcing Hybrid Amaryllis without drainage

As a matter of fact the root growth in the test cases was better than the average for hybrid amaryllis bulbs potted in ordinary soil for the same period, even when the latter were given the benefit of drainage. Flower production was approximately 80 per cent of normal for bulbs which are well established and pot bound, and was slightly better than the average results obtained the first season from bulbs newly potted in earth alone.

Of course it appears to be not practical to grow on the bulbs by this non-drainage method for the next blooming season. After flowering the bulbs can either be discarded as in the case of Paper Whites, or repotted in ordinary potting soil and grown on subsequently with good results. To attempt to grow them in the peat apparently would be difficult because of the problem of feeding them properly in the peat mixture and keeping this medium in a favorable condition, without drainage. This raises the interesting possibility of feeding each bulb with a proper nutrient solution in the undrained container. This matter would involve considerable additional research before any conclusive results could be secured, and what is mentioned here is only suggestive.

However, general use of the forcing method will undoubtedly lead to an additional and continuous demand in the trade for new bulbs, which are becoming available in quantity at reasonable prices, for the ordinary grades.

The method is clean, neat and simple, and while not adapted to the growing of high priced or fanciers' specimens, or exhibition plants for displays, should prove a fascinating innovation for indoor bulb gardeners.

HARVESTING, STORAGE AND FORCING AMARYLLIDS

I. W. HEATON, *Florida*

It was my former opinion, that Amaryllis could be forced with more regularity, than now seems possible. This point has been forcibly brought to my attention this past season in several instances. Here again we must consider the vast difference between greenhouse culture and our open air growing conditions in this state, where the bulbs are subject to rapid temperature changes and other abnormal conditions.

Forcing naturally interlocks with the subject of curing and storage and harvesting. From all available data it is apparent that the most opportune period for harvesting is the semi-dormant stage between the summer and fall growing season. In other words any time after the middle leaf has matured, ranging from August 1st to September 15th, before the fall flush of growth appears. If the bulbs cannot be dug at this time the next harvesting period follows the maturing of the fall flush of growth, generally December 1st to January 1st. It is not advisable to dig after this time. This past season we had three different control plots numbering 500 bulbs, all over four inches in diameter. Bulbs in plot No. 1 were dug in early September, cured only a few days, trimmed at the base and replanted. These flowered with normal size

blooms and thirty inch stems April 15th. The bulbs in plot No. 2 were dug in December and replanted. These also flowered in April. These bulbs apparently had made a normal root growth and had average foliage, and in spite of maturing seeds there was little shrinkage of the bulbs. The bulbs in plot No. 3 were dug on March 1st, replanted shortly after. In this case the bloom, produced May 1st, was not normal. The scapes were short, and no foliage was produced. The bulbs were badly shrivelled.

This clearly indicates that late harvesting and planting is not a good practice. While in New York this past spring I saw a planting of 500 imported bulbs, received in this country February 15th, and there was not a normal scape in the lot, while other plots of early shipped Florida bulbs had made nearly normal flowers.

Some indications point to a needed change in our methods of handling amaryllis bulbs, during the curing process. In some instances the bulbs have been cured too long, with devitalizing results. During the rush season we shipped this year bulbs which had not been cured a week and they carried perfectly, without heating or sweating. As this commercial strain is practically evergreen, there is no apparent reason for a long curing period, other than drying to permit safe transit.

Under greenhouse culture in the north there seems to be no standard practice, and each grower uses his own methods. From observation it appears that Mr. Jewell of New Rochelle, N. Y., Bobbink and Atkins, Rutherford, N. J., and Mr. William Mullias, Kenneth Square, Pa. are most successful in forcing amaryllis. The forcing methods used do not seem to be standardized. At one establishment I have noticed bulbs already under the benches, dried off, in July, and at others some still actively growing during September. My experience with greenhouse culture is limited to observation only and for this reason I do not feel qualified to suggest any changes in the methods used by the most successful growers. In checking the flowering dates of our named varieties grown in the north it appears that the bulbs can only be forced six weeks earlier than the normal flowering date here. Apparently this is partly due to even night temperature and partly to physical condition of the bulbs, from curing.

GRIFFITHS' SPEEDING UP FLOWERING IN DAFFODILS AND BULBOUS IRIS

WYNDHAM HAYWARD, *Florida*

Circular No. 367 of the United States Department of Agriculture, dated January 1936, is a posthumous publication of the late Dr. David Griffiths, Senior Horticulturist of the Bureau of Plant Industry, who died March 19, 1935. Its title is "Speeding up Flowering in the Daffodil and the Bulbous Iris." The text refers mainly to daffodils.

The pamphlet is an interesting and useful treatment of the subject

(Continued on page 272)

8. THE SOCIETY'S PROGRESS ¹

THE SECRETARY'S MAIL BAG

Describing the habits of *Zephyranthes pulchella*, an unusual and little known species from Lower Texas, Mr. Robert Runyon of Brownsville writes: "They grow in a low, clay soil of the gumbo type, and when the rains come in September they flower like magic by the tens of thousands." Mr. Runyon, a helpful cooperator, sent the Society a supply of the bulbs in the fall of 1936.

By an error of some boys engaged to make the collection, the bulbs recorded under A-33, Accessions of the Trial Collections Garden, page 23, 1936 "Herbertia," have proved to be *Cooperia Drummondii*, instead of *Zephyranthes pulchella* as originally listed. Further study of the bulbs leads to the opinion that they are the variety *chlorosolen* of *Cooperia Drummondii* as described by Baker. This is a more vigorous form than the type. A number of these bulbs of *Cooperia Drummondii* var. *chlorosolen* were distributed to members in 1936 as *Z. pulchella*, and recipients should note this correction.

The species of *Zephyranthes* imported from Argentina by the Society in 1934, listed under No. 22, Accessions of the Trial Collections Garden, page 31, 1935 Year Book, has been identified by Mr. H. Harold Hume, the *Zephyranthes* specialist of Gainesville, Florida, as *Z. mesochloa*, and the search for the genuine *Zephyranthes caerulea* (now classed as *Habranthus caerulea*), the "pale blue" flowered species, goes on. The *Z. mesochloa* bulbs were sent to the Society as *Z. caerulea*, but proved to be a fleeting, white-flowered form. The latest report of *Habranthus caerulea* has come from a collector in Asuncion, Paraguay, from whom it is hoped to obtain some bulbs of the true species so that ultimate distribution of this species may be made to the interested members.

Mr. R. A. Dyer, corresponding member for South Africa, writes under date of Feb. 10, 1937 that he has been nominated to go on a short botanical trip to Tristan da Cunha, for a few months. This trip to the lonely islands in the South Atlantic, about midway between South America and Africa, is the answer to a plant explorer's prayer. We wish the best of luck to Mr. Dyer on his trip, and hope his new species will be many. Perhaps there may be some unknown amaryllids to be found.

Mr. Hermon Brown, of Gilroy, Calif., sent the secretary a scape of a December-blooming Amaryllis which is probably a type of *Hippe-*

¹Information in this section was furnished by Mr. Wyndham Hayward, Secretary of the Society.—Ed.

astrum aulicum. Mr. Henry Nehrling, in his book "Die Amaryllis," states that *Hippeastrum aulicum* "blooms about Christmas time" in the open in Florida. Mr. Brown's flowers were received on December 21, and the flowers were just starting to open. The secretary has had bulbs of *Hippeastrum aulicum* for several years in his garden, the same obtained from European dealers, but they have steadfastly refused to bloom, apparently being of rather delicate and temperamental habit. Mr. Gilroy is located about 80 miles south of San Francisco, possibly the "farthest north" in latitude of any amaryllis grower who raises his bulbs in the open ground.

Considerable disagreement has been noted in recent years regarding proper time to dig Amaryllis bulbs for shipment. In Holland the practice seems to be one of delaying this procedure until late November or even December. Some growers in Florida dig their bulbs as early as September. It is hoped that scientific study will be undertaken which will throw some light on this knotty problem for various areas.

Col. Stephenson R. Clark, of Sussex, England, a member of the Society for several years, was signally honored in 1936 by the Royal Horticultural Society which conferred on him the Victoria Medal of Honor in Horticulture. Under the provisions of this award there are only 63 Medallists in the United Kingdom. The medal was established in 1897 under the patronage of Queen Victoria "to enable the Council (of the R. H. S.) to confer conspicuous honor on those British Horticulturists resident in the United Kingdom, whom it might from time to time consider deserving of special honor at the hands of the Society."

A good list of the newer Hemerocallis varieties worthy of a place in any perennial planting would advisedly be made to include "Cressida," one of the Carl Betscher varieties, which the writer first saw in full perfection in April, 1937 in the interesting garden of Prof. E. L. Lord, of Orlando, Florida, a daylily enthusiast of many years standing. Mr. Lord has one of the most extensive collections of these plants in private hands in the state. "Cressida" is a rich, fulvous-on-orange type.

Prof. J. C. Th. Uphof, of the Botany Department, Rollins College, Winter Park, Florida, writes that he will prepare a revised systematic treatment of the Alstromerias for publication in a future issue of "Herbertia." It is hoped to include this in the number honoring Mr. E. H. Krelage, the noted Dutch bulb authority. Prof. Uphof, an internationally known writer on botanical and horticultural subjects, is also of Holland origin.

The amaryllis and related bulbs have been actively promoted in the Pacific Northwest area in recent years by Mr. Harry L. Stinson, of Seattle. Mr. Stinson has made numerous speaking appearances before clubs, educational groups and on the radio in this work.

Members of the Society and others interested in amaryllids will be pleased to learn that a comprehensive text on the phylogeny, classification, breeding, propagation and culture of the amaryllids has been in preparation since 1933 by Dr. Hamilton P. Traub, the editor of our Year Book "Herbertia," for publication in book form in 2 or 3 years. Dr. Traub, who is marked for his untiring perseverance and boundless energy in the pursuit of sub-tropical horticultural research, will devote his spare time beyond the needs of the "Herbertia" editorship to this task, including vacations, if any. The writer has forgotten the year in which Dr. Traub took his last vacation.

Mr. Fred H. Howard of Montebello, Calif., and Mr. Richard Diener, of Oxnard, Calif., leading amaryllis growers of the Pacific Coast states, write distressing accounts of the damage to bulbs and other nursery stock received in the freezing weather of January, 1937, which caused the postponement of the 1937 spring National Amaryllis Show for one year. It is hoped that favorable weather and growing conditions through the rest of the year will enable the amaryllis in the field plantings to recover sufficiently to assure an outstanding exhibition for 1938 at Montebello.

Especial emphasis is placed by the writer on the beauty and decorative quality of *Habranthus cardinalis*, a rare species from the West Indies, which has recently been introduced into the United States (See Plate 48). The only known source of the bulbs is from Miss Violet Brace, of Nassau, Bahamas Is. The native home of the bulbs is not known definitely. Miss Brace writes that her mother had the bulbs in cultivation for many years. The flowers are of a remarkable cardinal red, and tilted from the perpendicular, usually standing at an angle of about 90 degrees. Miss Brace writes that the bulbs do not seed with her, and they are very reluctant about this in cultivation. For color alone, the species is easily one of the outstanding *Habranthus* species. It requires some shade in cultivation for best results, and moderately rich soil.

For marking special bulbs and particular lots of seedlings and propagations a number of the members have found small strips of .030 in. thickness sheet celluloid, with a negative finish, very satisfactory when the writing is done in waterproof drawing (India) ink. These labels may be made with a hole in one end, and attached to one end of a one-foot galvanized steel wire of about No. 12 gauge with good results in field practice. They remain legible for long periods.

It is with the deepest regret that the secretary records the death, on July 31, 1936 at the age of 73 years, of a very good friend and charter member of the Society, Mr. Robert E. Morrison. Mr. Morrison was born at South Norwalk, Conn., and followed the florist's profession. He was a resident of Tavaree, Florida, for the past 15 years, and was among those who were most active in reawakening interest in the amaryllids.

Mrs. Sarah V. Coombs, author of "South African Plants for American Gardens" writes that "The identity of some of the flat-leaved bulbs which I brought home from South Africa belonging to the *Haemanthus* group has been determined as *H. coccineus*. Others have not bloomed as yet here. I do not know whether there are other species besides *coccineus* having leaves growing in that way, but there is one species of the genus growing at Kirstenbosch, probably a new species, which has one single leaf, which stands up stiffly, and flaps solemnly back and forth in the wind. I do not know why it should be amusing, but it is. The Rain Forest species which I brought back has not been identified, as its blossom was very imperfect this year (1935). It most closely approaches *H. natalensis*, but is not that species. When it blooms again, the flower will probably be better."

The horticulturally neglected but important members genus of *Bomarea*, sisters of the alstroemerias, and within the field of the American Amaryllis Society, is the subject of an unusually readable article in the April quarterly (1936) of the National Horticultural Magazine. (Mr. B. Y. Morrison, editor). The author is Mr. E. P. Killip of the Smithsonian Institution, who has made an extensive study of these plants both in the herbarium and in the field. The article is illustrated with pictures of a number of dried, pressed Herbarium specimens of various species of *Bomarea*, but with no photographs of the plants blooming in nature or in cultivation. Four of the plates are interesting as being the type specimens of the following species, *Bomarea campanuliflora*; *B. zosteræfolia*; *B. salicifolia* and *B. incana*, all named by Mr. Killip.

Dr. H. Harold Hume, the *Zephyranthes* specialist, is going to turn his attention to the genus *Hymenocallis* shortly, according to a recent letter. This is good news as there is no group of plants of horticultural importance which more urgently needs attention than the "Spider Lilies," as they are so grossly libeled. The genus *Hymenocallis* contains some of the most varied types imaginable, some being deciduous, others evergreen, some with strap leaves and others with leaves like *Eucharis*. One species, *H. Amancaes* is yellow-flowered.

REPORT OF THE SECRETARY

With the publication of the 1937 HERBERTIA, the American Amaryllis Society may well be said to have attained the first significant landmark of its early years of work and progress. This commemorative edition, issued on the 100th anniversary of Dean William Herbert's publication of his pioneer monograph on the *Amaryllidaceae*, marks the high point to date of the Society's efforts for a revival of interest in the amaryllids as a group.

Three previous year books have come and gone, the first, a slender hopeful volume and the two immediately following expanding successively in value and depth of content, quality of pictorial representations,

and breadth of the field covered. So too, has increased annually the world-wide renewed interest in amaryllids.

With this issue the Society, in behalf of horticulturists, botanists and flower lovers everywhere, pays a belated tribute to a great man, great in knowledge and foresight that was years ahead of his time. He was a man of amazing genius and intellectual powers, almost forgotten for a century, so that today scarce mention may be found of his name in the great encyclopaedias, who was fitted to take his place with the brilliant figures of his better known contemporaries, had he chosen to direct his energies in more popular paths. But Herbert's life was that of the quiet, modest and unassuming gentleman of science, literature and theology. In this fourth number of HERBERTIA, Mr. Worsley contributes an outline biography that will help us to appreciate more fully the problems and accomplishments of the first great amaryllid enthusiast.

The year of preparation for this William Herbert commemorative number of HERBERTIA has been distinguished by the increasing expressions of warm support and active cooperation on the part of members, cooperators and other friends of the Society. The members have been faithful in the payment of annual subscriptions, which are the life blood of the Society's treasury, and a number of additional garden lovers, horticulturists, plant scientists, etc., have joined our ranks.

While the vagaries of weather conditions during the early part of 1937 precluded the possibility of holding the usual national and regional spring Amaryllis shows, it was possible to arrange for a National Show in the fall at Los Angeles, Calif. under the supervision of Mr. Cecil Houdyshel of La Verne.

Amaryllids have been coming forward as increasingly popular and varied display features of the great American flower shows, and this happy tendency shows signs of further development. Only the warmest commendation has been expressed in writing and in published reviews by critics of the 1936 HERBERTIA. Particular praise has been accorded to the interest and quality of the numerous illustrations which are contributed through the kindness of cooperators.

The human and living side of the amaryllis picture will continue to be emphasized in future activities of the Society. A number of attractive and interesting species were made available to the old and new subscribers during 1937.

Dr. Hamilton P. Traub, editor and director, has outdone his past performances in the present HERBERTIA beyond all question, and *each* succeeding year of helpful association with him in his mighty task of research, supervision and coordination of amaryllid matters brings only greater astonishment at his unflagging zeal and vitality, inspiring enthusiasm and critical judgment, not to mention his marvelous capacity for editorial "punishment" and his really outstanding comprehension of the subject.

The Society and its officers express their sincere gratitude to all supporting members and advertisers who have made these splendid numbers of HERBERTIA possible. We solicit your continued financial aid and material cooperation. Our Society lives only for and through its mem-

bers. It needs and invites most cordially your good will, friendly criticism, and active help in every particular. The members are urged to send in good photographs, accounts of their experiences with amaryllids, and last but not least that very essential subscription renewal and nomination of new members.

A few suggestions for the betterment of your Society: send in your renewals promptly; give a membership for birthday or Christmas presents to flower-loving relatives and friends; show the Year Books to all possible prospects for membership in your acquaintance; donate copies to your local libraries, garden clubs and horticultural societies; spread abroad in every way the news of what is being done with the amaryllids today. HERBERTIA can be no better than the members help to make it. I can only repeat that it is *your* Society.

The impossibility of rendering proper acknowledgement to all the individuals, institutions and other organizations which have so kindly given of their time, attention and helpful cooperation in the past year is a matter of deep regret to your Secretary. He hopes that this final word will be taken in the spirit it is intended, one of humble thankfulness for all that has gone to make the Society's work so successful.

WYNDHAM HAYWARD,
Secretary.

May 3, 1937,
Lakemont Gardens,
Winter Park, Florida

NOTICE OF 1938 NOMINATIONS

To the Members of the American Amaryllis Society:—

As provided by Article 5, Section 1 of the By-Laws of the American Amaryllis Society, which specifies that the secretary shall send to all voting members, not less than 90 days before the date of the annual election, a list of the offices to be filled, and the names of those whose terms expire, this information is hereby incorporated below, as an official notice to the membership. This notice will take the place of a separate mailed announcement to the members to this effect for 1938 elections.

President	-----	Mr. E. G. Duckworth, Florida
Vice Presidents	----	Mr. T. H. Everett, New York
		Mr. E. A. McIlhenny, Louisiana
		Mr. Fred H. Howard, California
Secretary	-----	Mr. Wyndham Hayward, Florida
Treasurer	-----	Mr. R. W. Wheeler, Florida

Director at large, for 3 years----Mr. Richard Diener, Oxnard, Calif.

Article 7, Section 1 of the Constitution, provides that any voting member may submit to the Secretary, not less than 60 days before the annual meeting, nominations for officers and directors. These shall be submitted to a nominating committee who shall select the candidates for the final ballot.

The annual meeting for 1938 will be held on April 13, being the second Wednesday of the month. Therefore the names of any suggested nominees must be submitted to the secretary before February 11, 1938.

WYNDHAM HAYWARD,
Secretary.

May 1, 1937,
Winter Park, Florida.

REPORT OF TRIAL COLLECTIONS COMMITTEE

Some unusually interesting Amaryllids have been added to the Society's Trial Collections garden during the past year. Some of the plant material in the garden has been made available for distribution during 1937 to certain classes of members.

ACCESSIONS, MAY 31, 1936 TO APRIL 30, 1937

A-81 to A-86—Contributed by Major Albert Pam of England

A-81 Seed of *Zephyranthes mesochloa*

A-82 Seed of *Griffinia Blumenavia*

A-83 Seed of *Hippeastrum phycelloides*

A-84 Seed of *Crinum Capense* (var. of *C. longifolium*)

A-85 Seed of *Hymenocallis speciosa*

A-86 Seed of *Crinum scabrum*

A-87—Seed of two *Cyrtanthus* species contributed by Mrs. W. E. MacArthur, Jacksonville, Florida, unidentified.

A-88 to A-89—Contributed by Robert Runyon, Brownsville, Texas. A-88 bulbs of *Zephyranthes pulchella*, rare yellow-flowered species. Collected within city limits of Brownsville, Texas. A-89 Seed of *Zephyranthes pulchella*.

A-90—Bulbs of *Zephyranthes pulchella*, contributed by Prof. H. B. Parks, San Antonio, Texas, "from a vacant half-block in the town of Ingleside in San Patricio county." Mr. Parks adds that the location is on the east side of Nueces Bay, and that the plants grew in heavy clay.

A-91—Seed of *Hymenocallis Amancaes*, the rare yellow-flowered Ismene type of *Hymenocallis*, from the Division of Plant Exploration and Introduction, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C. Collected in Peru.

A-92—Seeds of *Cyrtanthus* species, from Mrs. J. W. Archbell, Natal, South Africa; Several varieties identified only as to color.

A-93—Five bulbs, hybrid *Hippeastrum* received from Garfield Park Conservatory, Chicago, Ill.

A-94—*Hemerocallis* species, possibly *H. aurantiaca major*, from Mrs. J. H. Churchwell, Jacksonville, Fla. Plant is common in vicinity of Jacksonville but of unknown origin or identity.

A-95—*Haemanthus Natalensis*; seeds received from Mr. George F. Brockman, Louisville, Ky.

A-96 to A-103—Contributed by the Division of Plant Exploration and Introduction, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C. Bulbs collected in Brazil by Dr. W. A. Archer.

A-96 Three bulbs, *Hippeastrum* sp. P. I. No. 118776

A-97 One bulb, *Hippeastrum aulicum*, var. *robustum*, P. I. No. 118813

A-98 Five bulbs, *Hippeastrum breviflorum*, P. I. No. 118814

A-99 Two bulbs, *Hippeastrum calyptratum*, P. I. No. 118815

A-100 Two bulbs, *Hippeastrum psittacinum*, P. I. No. 118816

A-101 Three bulbs, *Hippeastrum puniceum* var. *barbatum*, P. I. No. 118817

A-102 Three bulbs, *Hippeastrum rutilum*, var. *crocatum*, P. I. No. 118818

A-103 Two bulbs, *Hippeastrum* sp., P. I. No. 118819

A-104—*Zephyranthes Simpsonii*, bulbs collected in South Orange County, Florida, by R. W. Wheeler, Winter Park, Florida, on cultivated field.

A-105—*Hymenocallis species*, seed from bulbs collected by Dr. H. P. Traub in Lee County, Florida. The plant has a one flowered-scape, with rather inconspicuous bloom, found growing in wet flatwoods land.

A-106 to 207—*Cooperanthes* hybrids, 135 bulbs, received under number and name from Mr. S. Percy-Lancaster, Secretary, Royal Agri-Horticultural Society of India, Alipore, Calcutta, India. These are the interesting bi-generic hybrids between *Cooperia* and *Zephyranthes* species described on pages 108-110 of the 1936 "Herbertia."

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A-208—*Crinum ammocharioides*, seeds contributed by the Lady Muriel Jex-Blake, Nairobi, Kenya Colony, East Africa. "Collected 23/11/36 at 6,000 feet altitude."

A-209—*Pamianthe peruviana*, pod of seed received from Major A. Pam, England.

A-210—*Zephyranthes* species, (probably *Z. texana*) seeds received from Dr. S. H. Yarnell, College Station, Texas.

May 1, 1937

Lakemont Gardens,
 Winter Park, Florida

WINDHAM HAYWARD,
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A complete file of *HERBERTIA*, the year book of the American Amaryllis Society, is indispensable to all who are interested in amaryllids. A limited number of copies of the following are still available:—

Volume 1 (1934). Containing the biography of Henry Nehrling, and many valuable articles on amaryllids; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

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The price of above described three volumes (Nos. 1, 2 and 3), for each volume, to members is \$2.25 postpaid, or \$6.00 for the three vol-

umes; to non-members the price for each volume is \$3.25 postpaid, or \$9.00 for the three volumes.

The price of Volume 4 (1937) is \$4.25 postpaid to non-members. All paid up members for 1937 receive one copy with their membership; additional copies to members will be sold at \$3.25 postpaid.

Make checks payable to the American Amaryllis Society, and send orders to the Executive Secretary,

DR. A. E. HUGHES, 823 Magnolia Ave., Orlando, Fla.

(Continued from page 260)

of forcing bulbs for early winter cut flowers, and many of the principles are already in almost general use among large commercial greenhouse growers. Various methods of accelerating the flowering period of bulbs are explained. The main emphasis is placed on the manipulation of storage temperatures prior to planting.

The recommended procedure is the application of common warm storage temperature to the bulbs for the period after digging up to the first of August, and then a constant temperature of 50 degrees F. up to planting time, September 1st or thereabouts. The results of the Department of Agriculture's work on these two bulbous plants constitutes a valuable contribution to horticultural knowledge for the florist and to plant science in general. The exact reasons for the behavior of the bulbs under the conditions described are apparently not known.

BUYER'S GUIDE

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Vol. 5
1938

HERBERTIA

VOLUME 5

DEDICATED TO
ERNST H. KRELAGE

EDITED BY
HAMILTON P. TRAUB
Mira Flores, Orlando, Florida

ORLANDO, FLORIDA
THE AMERICAN AMARYLLIS SOCIETY
1938

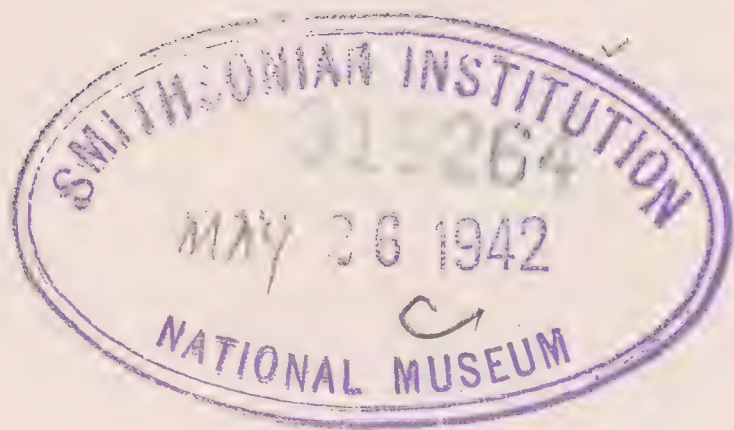
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AMERICAN AMARYLLIS SOCIETY

Printed in the United States of America

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This volume contains thirty-four plates and two figures.

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E Bot.

INTRODUCTION

In the horticulture of the Netherlands, the name of Krelage has been for many years well established and renowned, especially in bulb growing.

As long ago as 1829, a member of the family, E. H. Krelage, pioneered in holding cut flower exhibitions of new hyacinths. His son, J. H. Krelage, gave the stimulus that led to the founding of the General Society for Bulb Growing, and he served as Chairman of this organization from 1860 until 1900, a period of forty years. Under his leadership, the Society developed into a powerful and very influential horticultural organization.

In 1907, the contemporary E. H. Krelage was elected Chairman of the General Society, and prior to this he had served as a member of the Main Council since 1904. He held the office of Chairman for twenty-eight years, and carried on his duties with forceful tact and great energy. In his official capacity his wide knowledge and talent were available not only to the circle of professional men but also to the Administration of the Municipality, the Chamber of Commerce, the Horticultural Council of the Netherlands, and Government committees.

At congresses and exhibitions at home and abroad, E. H. Krelage was an important spokesman and advocate for the bulb industry, and he has contributed vigorously and indefatigably to the upbuilding of the bulb industry in all parts of the world.

In the field of science, E. H. Krelage also made important contributions. Due to his efforts, the bulb growing profession came into possession of its own laboratory for bulb research, and many of his scientific papers are an inspiration to present day workers.

The General Society for Bulb Growing recognized his great merits by electing him its Honorary Chairman when he retired as Chairman. The Honorary Nicolaas Dames Medal was bestowed upon him for his scientific achievements, including the origination of the new race of Mendel tulips. The Government did not remain behind in recognizing his abilities and worth. As early as 1909, he was appointed by the Netherlands Government as an Officer in the Order of Orange-Nassau, and in 1925 he was elected to Knighthood in the Order of the Netherlands Lion.

J. J. WINTERMANS,
The Director-General of Agriculture.

*The Hague,
Netherlands,
January 11, 1938.*

VOORREDE

De naam Krelage heeft in den Tuinbouw in Nederland en in het bijzonder in de bloembollenteelt sinds lange jaren een gevestigde en roemvolle naam.

Reeds in 1829 was er een E. H. Krelage, van wien het initiatief uitging tot het houden van een tentoonstelling van afgesneden bloemen van nieuw gewonnen Hyacinthen. Diens zoon J. H. Krelage gaf den stoot tot de oprichting van de Algemeene Vereeniging voor Bloembollencultuur, welke hij van 1860-1900, dus veertig jaren, onafgebroken leidde als voorzitter en onder wiens leiding de Vereeniging zich ontwikkelde tot den machtige en zeer belangrijke tuinbouwvereeniging.

In 1907 werd de heer E. H. Krelage tot voorzitter der Algemeene Vereeniging gekozen nadat hij al in 1904 zitting had genomen in het Hoofdbestuur. Gedurende 28 jaar werd het voorzitterschap door hem bekleed en deed hij bij voortduring van een krachtig beleid en groote energie blijken. Niet alleen echter in den kring der vakgenooten, doch ook in het bestuur der gemeente zijner inwoning alsmede in de Kamer van Koophandel, in den Nederlandschen Tuinbouwraad en in Regeeringscommissies werd hem gelegenheid gegeven zijn en gaven in dienst te stellen van het bedrijf dat hem zoo na aan het hart lag.

Ook op congresen en tentoonstellingen in het binnen- en buitenland is E. H. Krelage de groote woordvoerder en pleitbezorger van de bloembollenteelt geweest en heeft hij krachtig en onvermoeid bijgedragen tot verbreiding van den roem van de bloembollenteelt tot in alle deelen der wereld.

Ook op het terrein der wetenschap bewoog Krelage zich gaarne. Zoo werd, dank zij vooral zijn streven, het bloembollenvak verrijkt met een eigen laboratorium voor bloembollenonderzoek en trekken talrijke publicaties van zijner hand nog dagelijks de aandacht.

De Algemeene Vereeniging erkende dan ook zijn groote verdiensten door hem bij zijn aftreden als voorzitter het Erevoorzitterschap der Vereeniging aan te bieden, terwijl hem op grond van zijn wetenschappelijke prestaties (o.m. het winnen der Mendel-tulpen) de gouden Eeremedaille Nicolaas Dames werd toegekend. De Regeering bleef in de erkenning zijner kwaliteiten niet achter.

Reeds in 1909 was hij door de Nederlandsche Regeering benoemd tot Officier in de Orde van Oranje-Nassau terwijl in 1925 zijn benoeming volgde tot Ridder in de Orde van den Nederlandschen Leeuw.

DE DIRECTEUR-GENERAAL VAN DEN LANDBOUW,

J. J. WINTERMANS.

11 Januari, 1938
Den Haag,
Nederland

P R E F A C E

With this volume of *Herbertia* the members of the American Amaryllis Society celebrate the 69th. anniversary of the birth of Ernst H. Krelage, one of the most outstanding horticulturists of our time. In honoring him as a typical son, we also honor the Netherlands Nation as a whole, a race that has contributed much to the stability and progress of the world.

The Krelage autobiography is the main feature of this issue, and it is of primary interest not only to the horticulturist but also to the student of political economy for it shows what can be accomplished by competent leadership in agriculture.

The history of amaryllid culture in Holland, also by Mr. Krelage, adds another interesting chapter to the history of horticulture. We are glad to have also the introduction to the contemporary amaryllid breeders in Holland that is included in the text.

It is a welcome coincidence that the results of the researches of Dr. Uphof, a Hollander by birth, on the nomenclature of "*Hippeastrum* and *Amaryllis*" are included in this volume. After more than one hundred and sixteen years, an unfortunate error in the nomenclature of the two genera has at last been corrected thanks to the scholarship and research of Dr. Uphof, Professor of Botany, Rollins College, Winter Park, Florida. Dr. Uphof's paper will put an end to the dual use of the word "*Amaryllis*" for he proves that the inelegant and unwanted name "*Hippeastrum*" has been a superfluous one all these years.

We are fortunate indeed to have the very important articles on forcing amaryllids by Dr. Grainger and Prof. Dr. van Slogteren. These articles have been awaited with much interest. They will be of immediate value and will also serve as a basis for further progress in developing better methods of forcing such difficult subjects as hybrid amaryllis. There seem to be no valid reasons for hesitancy in undertaking similar investigations with hybrid amaryllis.

The daylily is rapidly coming into its own as one of the important plant subjects in American gardens. This is especially true in such a subtropical climate as central Florida where the first blooms usually appear in the middle of February, and through recurrent blooming the same varieties flower from four to five times by autumn. This same statement is true of the Southern States generally, except that the number of recurrent blooming periods may be fewer. In the North, the daylily is also appreciated and this is indicated by the activity of such enthusiastic workers as Mrs. Dewey, Mrs. Nesmith, Mr. Kelso and Prof. Graves. Every one is familiar with the important work of Dr. Stout of the New York Botanical Garden who has done much to increase interest in daylilies. His most important contribution consists of an array of excellent daylily varieties that have set a standard for others. He is actively engaged in breeding and he will undoubtedly make still greater contributions to the advancement of the daylilies.

There was a time when too many yellow and orange varieties precluded the use of daylilies as major garden subjects, but this stage is

passing rapidly. Good collections should now contain varieties with a wide range of color from dark velvety red, bright red, rosy-pink to coppery-rose, and other pleasing shades. This advance was made possible primarily by the introduction of *Hemerocallis fulva rosea* by the New York Botanical Garden.

The progress achieved so far with daylilies is only a mere beginning since the number of possible combinations is infinite. There are five classes of daylilies on the basis of stature—dwarf, semi-dwarf, semi-robust, robust and giant—and the color combinations are legion. Other characters—blooming period, foliage habit, flower shape, etc.—offer attractive possibilities. There is one great danger in daylily breeding. As a rule there are very few really inferior seedlings and this constitutes a great temptation to the breeder. In addition to keeping the high standard of the Stout varieties before him, the breeder needs to have his varieties evaluated by an impartial jury. Luckily this latter need will soon be taken care of. Mr. Kelso and Prof. Graves have had the courage to pioneer in this field, and this kind of activity will be undertaken on a national basis in the very near future.

We are happy to report that Mr. Edward Steichen, of Ridgewood, Connecticut, has been appointed Chairman of the Daylily Committee which has the immediate task of evaluating the numerous varieties that have and will be introduced. For this purpose trial gardens are being organized in all sections of the country and in most cases in cooperation with the State Agricultural Experiment Stations. The new varieties will be tested out in these trial gardens as soon as practicable. This committee will also make annual recommendations for the award of the George Yeld Medal which will be awarded to daylily breeders on the basis of outstanding varieties introduced that have been tested out on a national basis.

Other plant subjects that are coming into their own are *Cyrtanthus*, *Alstroemeria*, and *Bomarea*. *Cyrtanthus* appear to be excellent for forcing, and some of the species at least are of the easiest culture. As pot plants they are unexcelled. *Alstroemeria* and *Bomarea* make excellent cut flowers. Flower spikes of *Alstroemeria* in the writers garden remain in prime condition for a very long time. It is reported that *Alstroemeria* is used extensively in the cut flower trade of Australia.

During the last season, Dr. Hughes resigned as Executive Secretary for business reasons after serving the Society faithfully and efficiently. The gratitude of the members is due Dr. Hughes for his unselfish service.

The Society was most fortunate in securing a worthy successor to Dr. Hughes in Mr. R. H. Gore, an outstanding newspaper publisher, and former Governor-General of Puerto Rico. Mr. Gore is genuinely interested in plants and his collection will rapidly become one of the major ones in the country.

We are very happy to report that Mr. Wyndham Hayward, the talented and hard working Secretary of the Society, has fully recovered from his illness. His stimulating presence is a distinct asset to the Society for it was through his efforts primarily that the Society was built up so rapidly.

Herbertia for 1939 will be dedicated to South Africa. The main features for this issue are in preparation by members of the Society resident in the Union of South Africa. It promises to be a most valuable issue. Other dedications for future issues of Herbertia are—1940, Latin America; 1941, Australia; 1942, Major Pam; and 1943, 10th Anniversary Number.

—HAMILTON P. TRAUB,
Editor.

June 15, 1938
Mira Flores,
Orlando, Florida.

I had an enjoyable visit with Dr. Stout at the New York Botanical Gardens to-day. He showed me some of his outstanding new daylily hybrids, and also the excellent color plates for his great monograph on *Hemerocallis* to be published soon.

To-morrow I will sail on the Swedish liner *Gripsholm* for Scandinavia.
New York City, July 22, 1938

—H. P. T.

This was a red letter day in my travels to date for I visited the Linnaeus Botanical Garden and Museum, and also the tombs of Carl von Linne, and Emmanuel Swedenborg in Uppsala Cathedral.

In 1918, the Linnaeus Botanical Garden was finally restored and opened to the public. It is in the original location and has been restored according to the plan published during Linnaeus' life time. Even the original iron gate to the Garden has been found and replaced.

In 1937, the Linnaeus Museum was opened to the public. It is housed in the building adjoining the Garden that was used by Linnaeus both as a home and laboratory. Many of the original furnishings have been restored to their former places.

Now that these attractions exist, Uppsala will surely become a Mecca for those interested in plants.

The dominant amaryllids observed in flower under cultivation up here—Hardangarfjord at Norheimsund, Vik, and Fossle; the environs of Oslo; and in Stockholm and other parts of Northern Sweden—are various species of *Hosta*. The finest display was seen at Old Uppsala.

At Goteborg, the fine Horticultural Garden was visited. The collections of plants, outdoors and under glass, are noteworthy and include such amaryllids as *Crinum*s, *Clivia*s, etc.

Uppsala, Sweden, Sept. 7, 1938.

—H. P. T.

The dominant amaryllids observed in flower under cultivation below Stockholm, in central and southern Sweden—Svalov, Almarp and Malmo; in Denmark—Copenhagen and Helsingore, were again species of *Hosta*. In Germany and Czechoslovakia, *Vallota purpurea* and *Haemanthus albiflos* were quite common as pot plants, and *Hosta* species were also in flower in the gardens.

Praha, Czechoslovakia, Sept. 7, 1938.

—H. P. T.

Hosta species are still the dominant amaryllids, and were observed in flower at Brno, Bratislava, Buda-Pesth, Vienna, and southward to Venice, Milan, Florence, Rome and Naples. In southern Italy one also meets with an abundance of *Callicore*

rosea, including remarkable color variations from almost white to deep pink. These are much used as table decorations at Sorrento, Amalfi, Capri and elsewhere.

On the way down from Vienna to Venice one saw the valley fields covered with autumn crocus.

Capri, Sept. 22, 1938.

—H. P. T.

Still *Hosta* species—northern Italy up to the Simplon Tunnel, Switzerland, France, Belgium, Holland and England. It seems that an opportunity has been missed by those interested in plant breeding. This subject should prove stimulating to the members in Canada and the northern United States.

The valley fields in western Switzerland and northern France were covered with countless autumn crocus. This is also a neglected subject by the American landscape gardener.

It was inspiring to work at the Royal Botanic Garden, Kew. I am especially indebted to Sir Arthur W. Hill, Director, for extending the invitation to come to Kew, and to his brilliant and efficient staff for constructive criticism and inspiring guidance. I am particularly grateful to Dr. A. D. Cotton, Keeper of the Herbarium and Library, Dr. T. A. Sprague, Deputy Keeper of the Herbarium, Mr. J. R. Sealy, Botanist, Mr. E. Milne-Redhead, Botanist, Miss Ruth Taylor, Botanist, Mr. W. R. Campbell, Curator of the Garden, and Mr. L. Stenning, Assistant Curator, all of whom did much to make my stay at Kew both enjoyable and profitable.

I also had a most enjoyable visit with Major Albert Pam and his family, and on Oct. 11, I attended the Royal Horticultural Society Show in London, consisting of flowers, fruits and vegetables in season. There was a great variety of exhibits, and the attendance was large. On account of lack of space only the amaryllids will be mentioned here with one exception.

There was an outstanding display of *Lilium candidum* var. *Eximium*, grown by the Royal Botanic Garden, Kew, on behalf of the Department of Agriculture, St. Helena.

Amaryllids were shown by Hocker Edge Gardens: *Nerines*, including *filifolia*, *Fothergilli major*, and hybrids, *Sternbergia lutea*; Perry's, Enfield: *Amaryllis aulica*, *Brunsdonna* vars. *Hathor* and *Baptista alba*, *Argyropsis candida*, *Nerine Bowdeni major*, *Tulbaghia violacea*; Ernest Ladhams: *Hosta lanceolata*, *Nerine Bowdeni major*; The Corporation of Falmouth: *Callicore rosea*.

The visit to the fine Lindley Library at the Headquarters of the Royal Horticultural Society in London was very interesting, and there I had the pleasure of meeting Mr. William T. Stearn and Dr. A. Grove. On account of the recent international crisis, the manuscripts relating to William Herbert had been taken to the country for safe-keeping, and these could not be inspected.

To-morrow I sail for home on the R. M. S. *Queen Mary*.

Royal Botanic Gardens, Kew, England,
October 12, 1938.

—H. P. T.

On my return after an absence of three months, the proofs of this issue of *Herbertia* were awaiting me. They had also traveled to Europe and back. I am very sorry that this has happened, but trust that the many fine contributions by the members will compensate for the delay.

Mira Flores, Orlando, Fla.,
October 23, 1938.

—H. P. T.

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E R R A T A

HERBERTIA, VOL. 4, 1937

- Page 22; delete "azaleas, camellias" at the beginning of 15th. line from top (text).
- Page 24; 2nd. column of table, 9th. entry from top, for "*C. angustifolium*" read "*C. angustifolium*."
- Page 63; 3rd. line from top, for "*Institute*" read "*Institution*."
- Page 63; 13th. line from top (text), for "are" read "is."
- Page 63; 14th. line from top (text), for "most" read "more."
- Page 64; 17th. line from bottom (text), for "immorality" read "immortality."
- Page 79; 2nd. and 3rd. lines from top (text), delete "illustrated in Plate 48."
- Page 157; Plate 66, credit line, for "Max Hoeber" read "Max Loebner."
- Page 161; 2nd. line from top (text), for "Plate 56" read "Plate 60."
- Page 177; 1st. line of table, following "GILLIESIEAE" insert "0" under "No. of species," and insert "—" under "Basic. Chrom. no." and "Range (2n)."
- Page 177; 7th. line of table, for "GILLIESIEAE" read "GALANTHEAE", and delete "O" and two "—" following.
- Page 189; 2nd. line from top (text), for "seeding" read "seeing."
- Page 206; Plate 76, for Figs. "8a" and "8b" read "8" and "9" respectively.

This volume of Herbertia
is dedicated to Ernst H. Krelage
in celebration of the 69th Anniversary of his birth



From the painting by Oscar Mendlik. 1935

Ernst H. Krelage

ERNST H. KRELAGE

An autobiography



Ch. Binger & Co., Haarlem, 1872

Fig. 33. Ernst H. Krelage
at the age of three years.

In the 18th Century my ancestors were peasants in the village Epe near Bramsche, in the neighborhood of the town of Osnabruck, Hanover. In 1804 the youngest son of Johann Franz Krelage (1739-1798) was sent to Holland after his father's death. The eldest son, being the only successor to his father as owner of the farm, could not offer a sufficient inducement to his brothers in those disturbed days of the Napoleonic troubles. So the youngest, Ernst Heinrich (1786-1855) arrived in Holland, and, after many difficulties, succeeded in settling himself in Haarlem as a florist in 1811. He soon specialized in bulbs and at his death in 1855 he was universally recognized to have become foremost in his profession.

His only son Jacob Heinrich (1824-1901) became his partner in 1851, and beginning in that year the business was continued under the style of E. H. Krelage & Son. He extended his firm's world wide reputation and did

not confine himself to bulb growing, but also cultivated extensive collections of such varied subjects as conifers, Cactaceae, strawberries, peonies, dahlias, stove and greenhouse plants. He also had a seed trade. In 1889 he put the first Darwin tulips on the market, which have exercised a most remarkable influence on tulip growing in general. In 1860 he founded the General Society for Bulb Growing, and he remained its president during forty years. He also organized the (now Royal) Netherlands Horticultural and Botanic Society and the first Haarlem Bulb Exporters' Association. He very actively took part in manifold social, economic and political activities in his town and country. He worked more for the general welfare than for his own profit.

Jacob Heinrich had one son—from his second marriage with Albertina Dina Wilhelmina Schneither (1828-1917)—the author of this autobiography, Ernst Heinrich Krelage, born in 1869.

After having visited the Haarlem public and Latin schools, I entered the University of Amsterdam as a student of biology in 1887. I did not finish my studies because of my father's advanced age and bad state of health, which made my entrance into the firm urgent, and I became my father's cooperator and soon his partner. After my father's death in 1901 I remained the only leader of the firm. My career will be described in particular hereafter.

In 1910 I married Elisabeth Keppel Hesselink who gave me a son and two daughters. The elder daughter married and settled in Netherlands East Indies.

A few years after the World War I gradually discontinued business, devoting myself exclusively to work in horticultural organisations, and from which I definitely retired at the end of 1935. Being then free from all responsibilities, I traveled with my wife to Java (Netherlands East Indies) to visit our daughter and her family. We traveled not only through Java in all directions, but also visited the islands of Sumatra, Bali and Nias. We returned home in December 1936 and since then I have been collecting and studying documents on the history of the bulb trade.

When I started my activity in my father's firm, a young leader was urgently needed there. As a boy I had not shown special interest in bulb growing or gardening in general. My father, overwhelmed with his manifold occupations for the sake of community and horticulture, could not concentrate his energy on his own commercial interest and consequently the firm's former prosperous condition changed into stagnation. The uncertainty as to whether or not the son would in the future continue the firm, was the reason for delayed improvements and extensions. My father's advanced age made things even worse.

As a youth I became well aware of these facts during my university holidays at home. My father had never commanded me to carry on the business, but I now considered it my duty to do so. I liked this prospect the more because of the difficulties to conquer. With youthful impulse I felt happy in reorganising, renewing and reforming the old firm, and after a few years I had the satisfaction of complete success, with my father's hearty approval.

My father had always adhered to the old system of growing collections of a plant genus as complete as possible, keeping numerous obsolete varieties of historical interest only, which ought to have been replaced by newer, improved forms.

Successively the assortments were revised, older varieties discarded and the number of varieties reduced. New seedling and imported varieties were put on the market. A large efficient warehouse was erected to replace older buildings. New bulb grounds were put in cultivation.

An important task was the publication of a new series of descriptive catalogues, which started in 1892. As in the past they were issued in English, French, German and Dutch but from then on only twice a year, in spring and autumn. These catalogues which were very favorably received by the horticultural press, stimulated a highly increased sale, which continued until the year 1914, when the World War immediately

stopped the prosperous activity of the firm. Meanwhile separate editions had been issued in Swedish, Danish and Russian.

Special catalogues in three languages were published on Darwin tulips, Chinese peonies, German irises and *Gladiolus gandavensis*. These catalogues contained historical and other original records, which were often reprinted in horticultural periodicals.

Although the firm from its first start had always carried both wholesale and retail trade, the latter became the more important in the 20th Century. It was not a small parcel post trade for the average order was fairly large due to the many large orders from royal gardens, botanical institutes and private estates. This class of customers learned to appreciate correct naming and reliable quality of the goods ordered. As the firm grew, a great many less known bulbous plants were added and the true amateurs all over the world became our faithful customers.

The firm was officially appointed purveyors, with the right to print the royal coat-of-arms on its publications and letter heads, to King William III and Prince Henry of the Netherlands, the Kings of Italy and Greece, the Grand Dukes of Baden, Luxemburg and Mecklenburg-Schwerin and Prince Ludwig of Bavaria.

Ever since the first Krelage had established himself as a bulb grower, he became an exhibitor at the then very rare flower shows in Holland and abroad. His son continued the participation at international horticultural shows and world's fairs on a much larger scale. After the introduction of the Darwin tulips to the trade it was necessary to show them repeatedly to horticulturists and the public in general. There was a threat that this superior strain of breeder tulips would be seriously attacked by unscrupulous bulb merchants who did not hesitate to sell inferior late tulips under the name of Darwin tulips. The most efficient way to stop these unethical methods was to show the true Darwins in all their splendor and endless variety at the great horticultural gatherings. The result fully justified these efforts—everywhere in Holland, Germany, France, Belgium, England and elsewhere the Darwin tulips gained the highest honours and they were repeatedly described and figured in the leading horticultural papers in enthusiastic reports by experts. The reputation of the Darwin tulips was therefore fixed forever.

The firm often sent other exhibits of special interest to the leading shows, and its hyacinths, narcissi, amaryllis, gladioli, dahlias, kniphofias, peonies and numerous other bulbous and herbaceous plants achieved a justified success. The novelties were regularly submitted to the Floral Committees at Haarlem and Amsterdam, and from time to time to those of the Royal Horticultural Society at London and, in the course of about thirty years, over one thousand awards, and hundreds of first class certificates were obtained.

As soon as I had started in business, I made several trips to other European countries in order to introduce myself, to maintain old and to obtain new relations for the firm. I appreciated the value of bearing a universally respected name, which assured me of a hearty and friendly

reception everywhere. I visited the firm's customers among whom the Princess of Monaco was a very important one in 1892. There were however numerous changes among the head gardeners of the palace gardens in those days and this made the yearly renewal of the order doubtful. During my stay at Nice, I therefore decided to get in touch with the Princess herself and wrote from my hotel soliciting an audience. This was agreed to and the result was a big order, which was repeated during a series of years. My father was much impressed with this energetic effort of his son since he had in full confidence entrusted to him the leadership of the firm.

In 1894 for the first time I was presented to the young Queen Wilhelmina and her mother, the Queen Regent, who honored the parade beds of hyacinths in one of the firm's nurseries near Haarlem with a state visit.

In later years the Queen paid another visit to the firm's gardens in Haarlem (1912). The Prince-Consort Henry had already visited them in 1903. Numerous rulers of other countries had been visitors to the nurseries in the past. I will only mention those visits which took place after I entered the firm,—the Egyptian Prince Fouad, who later became King (1903); Prince Eugen of Sweden, the famous painter, who repeated an earlier visit of thirteen years ago (1907); Princess Lewis of Bavaria with five daughters (1908); the Princess of Thurn and Taxis, a born Archduchess of Austria, with four sons (1910), and the Archduke Franz Ferdinand of Austria with his wife (1911).

The unfortunate Austrian Crown Prince, who was murdered at Serajewo in 1914, was an enthusiastic flower lover. On his trip to Holland he studied all branches of horticulture with the object of fostering the cultivation of flowers and other crop plants in his own country. I showed him and his charming wife round the bulb district after their visit to the historical exhibition in my bulb gardens on the occasion of the firm's centenary. I afterward received a personal letter from the Archduke inviting me to a visit to Vienna and his gardens, but owing to the tragedy of Serajewo the opportunity was lost forever.

NOVELTY RAISING

Before the year 1900 practically all of the innumerable varieties of bulbous plants which composed the assortments during more than three centuries had been obtained by producing seeds without artificial hybridization. Fertilization was left to the wind and the insects. The variability was so great that the opinion generally prevailed among growers that crossing on purpose would not have any better effect than accidental fertilization.

I probably was the first bulb grower who undertook the improvement of the existing assortments by systematic hybridization. I continued these efforts for over twenty years with the assistance of Mr. J. F. C. Dix, who later became editor of three horticultural periodicals in Holland. The raising of new bulbous plants takes a life's time. Five to six years is the shortest period before the first flower of a seedling may be expected



Wegner & Mottu, Amsterdam

Ernst H. Krelage in 1889



Ernst H. Krelage in 1935

See page 44

and it takes a longer period again before this seedling, if superior to the existing varieties, will have multiplied sufficiently to be offered to the trade. Thus one does not know the results of a cross before five or six years, and meanwhile other crosses must be performed without the advantage of the knowledge that might be gained from the one made previously.

Raising bulb novelties consequently is very trying but on the other hand it may give the greatest satisfaction if the results should correspond with the hybridiser's expectations. I have been very fortunate in this respect and have produced several series of varieties, even entirely new strains of bulbous plants which show every probability of becoming leading trade varieties of the future. Only the most remarkable of these seedlings will be referred to here.

TULIPS. The introduction of the Darwin tulips by my father, who showed them for the first time at the Paris World's Exposition of 1889, has revolutionized tulip culture. These stately flowers with their dazzling colours and their long stems soon proved to be far more suitable for cutting than the short stemmed early varieties. When repeated experiments had demonstrated the extraordinary forcing qualities of many varieties, they became serious rivals to the early tulips. Statistics have since proved that the export from Holland of late tulip bulbs nowadays surpasses that of the early varieties, and this is in accordance with the fact that the area devoted to late tulips in Holland is now larger than that occupied by early tulips.

The growing demand for May-flowering tall tulips led to the collecting of varieties of this character from old cottage gardens. Notwithstanding the very extensive list of varieties in the trade, there proved to be an opportunity for the hybridiser.

I first crossed Darwin varieties with other May-flowering tulips in order to combine the sturdy habit of the former with color shades of the latter, and to obtain pure white, and yellow Darwins, which were missing in the original collection.

The "Tentative List of Tulip Names" and its supplement, issued by the Royal Horticultural Society as the result of the work by a mixed Anglo-Dutch Tulip Committee, contains the names of the named seedlings raised by my firm. Most of them bear names given by the firm, but after the firm's public bulb sales in 1923 some seedlings came into other hands and were named and offered by others, without mentioning the raiser's name.

Among numerous others the following may be referred to as the most successful, all grouped in the section of Cottage tulips in the Tentative List. (A. M. means Award of Merit. F. C. C., First Class Certificate.)

Aegir, dark cochineal carmine.

Albino, pure white; F. C. C. Haarlem, and award for early forcing.

Alcmene, deep cochineal carmine; A. M. London and Haarlem.

Amber, buff, shot rose; A. M. London and Haarlem.

Ambrosia, fawn, shaded rosy lilac; A. M. Haarlem.

- Argo*, golden yellow spotted orange; forcing award Haarlem.
Aviso, salmon rose outside, red on yellow inside.
Bianca, heliotrope, flushed buff at margin.
Buff Beauty, salmon buff.
Caesar, deep scarlet; A. M. Haarlem.
Carrara, white; F. C. C. London, A. M. Haarlem.
Cecilia, coppery orange, outside amber; A. M. Haarlem.
Dido, fawn shot rose; F. C. C. Haarlem, A. M. London.
Dulcinea, deep rose outside, light scarlet inside; A. M. Haarlem.
Hellas, cerise.
Idyll, pale lilac; forcing award Haarlem.
Ilona Durigo, pale salmon tinged lilac rose.
Jupiter, pale cerise; A. M. Haarlem.
Leda, deep cerise; A. M. Haarlem.
Luna, yellow; A. M. Haarlem.
Marvel, amber, shot; A. M. Haarlem.
May Kiss, white edged violet.
Miami, geranium lake.
Mrs. F. E. Dixon, Sulphury white; A. M. Haarlem.
Mona Lisa, orange.
Nectar, carmine; A. M. Haarlem.
Novara, fawn shot rose.
Orient, carmine violet flushed fawn; A. M. Haarlem.
Pallieter, yellow shot bronze; A. M. Haarlem.
Pandora, fire red, carmine outside.
Papillon, rosy lilac flamed reddish purple.
Phryne, yellow shot dull purple.
Pierre Loti, violet purple.
Plato, deep lemon yellow.
Preludium, deep fire red, reddish apricot outside.
Prince Carol, purplish carmine.
Remus, old gold with golden edge; A. M. Haarlem.
Romulus, orange red with yellow edge; A. M. Haarlem.
Rosebud, pale carmine rose.
Ruby, currant red.
Scarletta, scarlet.
Solon, pale carmine rose; A. M. Haarlem.
Sunny, cochineal carmine.
Tamborah, creamy white.
Themis, white; A. M. Haarlem and London; forcing award Haarlem.
Triton, light crimson; A. M. Haarlem.
Tuscania, inside orange shot cochineal carmine, outside carmine.

A distinct section of the Cottage tulips is composed of the Lily-flowered varieties. It often struck me that lady visitors to our gardens were always much impressed by *Tulipa retroflexa*, the well known yellow tulips with reflexed petals. I therefore concluded that a series of similar varieties in various colours might be desirable, and that the crossing of *T. retroflexa* with various May-flowering tulips of other colors might

give the result wanted, and indeed it did. The first flower which opened, having kept the reflexed petals of *retroflexa*, was of a shining satiny pink. It created a sensation when shown for the first time at Haarlem and at London, and at once *Siren* received First Class Certificates, although the rules require that this high honor may only be given after an award of merit has been obtained the foregoing year. It was a cross of *retroflexa* with the pink Darwin, *Psyche*, and the first of a whole series of Lily-flowered tulips. My other contributions to this series were the following:

Actaea, lemon yellow.

Adonis, cerise red; A. M. Haarlem.

Alaska, yellow; A. M. Haarlem.

Apollo, salmon rose.

Artemis, carmine purple; A. M. Haarlem.

Daphne, Sulphury white.

Eclipse, amber flushed pink.

Reine de Suède, claret.

Ruby Queen, blood red, streaked black upon middle of outside.

White Cross, white.

White Duchess, white; A. M. Haarlem and London.

The group of the Dutch Breeder tulips, which included many brown, purple, red, sometimes bronze varieties of former days, was revived to increased importance by the addition of my seedlings, and this also led other hybridists to work along similar lines. The crosses were chiefly made between Darwins and Dutch Breeders, and the following were among my best results:

Amun Ra, amber flushed purple.

Brocade, yellowish bronze.

Brown Beech, dark brown.

David Copperfield, mauve, shot fawn.

Dreadnought, violet flushed white.

Edith Carter, orange, shot red purple.

Fairy Nymph, violet purple, shot and edged with yellow.

Fleur Parfaite, lilac.

Golden Chieftain, reddish chrome.

Henri Nonin, old gold and bronze, shaded violet outside.

Ilias, purple; A. M. Haarlem.

James A. MacDonald, sienna, shot terra cotta.

John Riding, old gold, flushed bronze.

Joy Mc. Arden, brownish orange; A. M. Haarlem.

Leonard Barron, orange red, flushed carmine outside.

Maryland, orange red with lighter edge.

Melva, pale fawn, flushed lilac.

Nevada, orange flushed red.

Parthenope, lilac and bronze.

Prairie Queen, sulphury white flushed yellow.

President Hoover, scarlet inside, flushed orange scarlet outside; A. M. London.

Rooda, brownish orange.

Sonate, orange, shaded red with carmine blush inside; A. M. Haarlem.

Sunbeam, old gold, shaded bronze.

Tantalus, dull yellow, flushed pale purple; A. M. Haarlem.

The Imp, dull orange, shot mahogany.

Vendetta, lilac and bronze.

Victor, fiery red.

Visor, fawn, shot lilac.

The Darwin group was also extended by new seedlings of my raising, of which the following may be mentioned:

Alice Keith, reddish chrome, passing to fiery red.

Baron de Stael, bright violet, paler outside.

Blue Bird, rosy lilac.

Alice Keith, reddish chrome, passing to fiery red.

Corot, lilac flaked reddish.

Delphi, purplish mauve.

Homère, scarlet; A. M. Haarlem.

Madame Butterfly, violet mauve edged white.

Marshal Field, old carmine red inside, buff outside.

Mary Garden, white tinged pink.

Mimosa, yellow.

Mrs. Harold Irving Pratt, vinous mauve; A. M. Haarlem.

Pulcinella, cochineal carmine.

Ronald Gunn, slaty lilac; A. M. Haarlem.

Saracen, old carmine red inside, buff outside.

Terra Cotta, dark old rose.

Toplight, primrose yellow.

Zev, bluish violet.

Repeated efforts were made to obtain new Parrot forms. Evidently the Parrot character cannot be produced by hybridizing since none of the seedlings from many combinations ever showed the fringed petals of the parrot tulips. In later years remarkably fine parrot tulips originated as sports from Darwin varieties, quite superior to the old forms on account of their tall stems and varied colors.

In the small section of late Double tulips two new seedlings were produced:—

Mirabeau, pale lilac.

Sinclair Lewis, red and yellow.

After the production of so many novelties in the existing groups I succeeded in adding an entirely new strain to the tulips of the trade. Although certain May-flowering varieties could be forced into bloom as early as January, I found that long stemmed tulips which could be relied upon for early forcing were urgently needed.

There were reliable early tulips for this purpose, but their stems as a rule were rather short and their color range limited. So I tried to combine the early-forcing qualities of the small, short stemmed, but ex-

ceedingly early Duc van Tol varieties with the long stems and the color variations of the Darwins. Therefore a systematic series of crosses was yearly performed from 1909 to 1918. The Duc van Tol varieties, planted in the open, were used as seed plants and the Darwins, forced so as to be in flower when needed, served as pollen plants. The results were watched with the keenest interest and it was a great joy to state in 1915 that the results of the very first crosses fully came up to my expectations. The first hybrids thus obtained, *April Queen* and *Early Beauty*, could easily be forced within a very short period, and had well shaped flowers on stems intermediate between those of the Darwins and the Early tulips. Similar crosses were made annually and these furnished hundreds of distinct seedlings, the qualities of which had to be studied carefully and repeatedly before their value could be definitely determined.

Of course, it was not sufficient to state that they were decorative garden plants. Their commercial future exclusively depended upon their early-forcing qualities. Many of the seedlings had inherited the rapid multiplying quality of many Darwin varieties, and consequently rather extensive stocks of some were successfully grown within a few years. I named the new strain *Mendel* tulips, in the same sense as my father had baptized the *Darwins*. The following selection is now considered to compose a standard collection. They are arranged according to crosses, thus showing that some of these furnished more good hybrids than others.

a. Duc van Tol, White Maximus X Darwin, Psyche.

Adinda, lilac pink.

Amidonette, rosy red edged white.

Delice, delicate rose and white; early-forcing award.

Her Grace, white, broadly edged rose; early-forcing award.

Mengelberg, rose with pure white edge.

Pink Gem, white and rosy, very early; F. C. early forcing award.

Weber, white edged lilac rose.

Zenith, satiny rose; A. M.

b. Duc van Tol, White Maximus X Darwin, White Queen.

White Sail, creamy white passing to pure white.

c. Duc van Tol, Cochineal X Darwin, Pride of Haarlem.

Brightling, salmon rose.

Fabiola, cherry rose; early forcing award.

Herald, vermilion; A. M.

Nansen, bright red; early forcing award.

Proof Zeeman, orange.

Scarlet Wonder, scarlet.

d. Duc van Tol, Cochineal X Darwin, Psyche.

Early Queen, rose, pointed petals.

Mrs. E. H. Krelage, deep rose; early forcing award.

Rose Marie, white passing to soft rose.

e. Duc van Tol, Crimson X Darwin, Bartigon

Fuga, deep scarlet red.

f. Duc van Tol, Crimson X Darwin, Farncombe Sander. Krelage's Triumph, dark brownish red.

g. Duc van Tol, Crimson X Darwin, Madame Krelage. Sultane, rosy red.

h. Duc van Tol, Violet X Darwin, La Tulipe Noire. Dodonaeus, maroon with golden yellow edge.

Apart from the Mendel tulips, crosses were also made between Duc van Tol varieties and single Early tulips. As a rule May-flowering varieties were secured which belong to sections already dealt with—"Cottage" and "Dutch Breeder" tulips.

NARCISSI. My work with the hybridizing of narcissi started in 1901 and the first flowers appeared five years later. The chief aim in the beginning was to obtain improved trumpet daffodils with long stems and with flowers well placed on the stem at a right angle. I did not care for giant or mammoth blooms, but preferred a well balanced flower with overlapping perianth. *King Alfred* proved to be an excellent parent plant. The first results were *Glory of Haarlem*, and *Hope of Holland*, both good yellow trumpets, that gained awards of merit in 1910 but have since been surpassed by newcomers. The same award was given to the yellow trumpets *Candlestick*, *Duke of York*, *Early Beauty*, *Faust*, *Floris*, *Frans Hals*, *Golden Lion*, *Geertruida Carelsen*, *March Glory*, *Odin*, *Pelleas*, *Phryne*, *Plato*, *Primrose*, *Perfection*, *Thackeray*, and *Versailles*.

All the seedlings came up to the desired qualifications, varying in color shades from pale primrose to deep, almost orange yellow.

Bicolor varieties which obtained awards of merit were: *Albertine*, *Capri*, *Palamedes*, *Prof. Westerdijk* and *Rosa Lynd*. The latter proved to be an excellent forcer and was faultless as a pot plant, all the flowers blooming at the same height in profusion.

The *White Trumpets* were very successful. In 1914 the firm gained the White Daffodil Trophy at the Birmingham Daffodil show for the six best White Trumpets. Owing to the war this effort could not be repeated during four years and the trophy, which had to be won three times, remained in Great Britain. The seedlings which received awards of merit at Haarlem were *Adelaide*, *Blanchefleur*, *Ismene*, *Josine*, *Medea*, *Melisande*, *Pegasus*, *Themis*. Best of all was *Mrs. Ernst H. Krelage* (Plate 95), first shown at the Haarlem Jubilee Flower Show of 1910 (Plate 93) and it was at once considered to be the coming variety. Not only were its flowers absolutely faultless in every respect, but the variety also had excellent forcing and breeding qualities. It first received awards of merit, then First Class Certificates in London, Haarlem and Amsterdam, and was awarded first prize as the best trumpet daffodil flower at the London Daffodil Show of 1912.

When this novelty was shown in London at a two days' floral meeting of the Royal Horticultural Society I found that two flowers were missing in the early morning of the second day. It was obvious that

they were taken away by someone interested in the pollen of the winning flower. This incident was very serious and on my returning home I told it to an American reporter, who came to interview me for other purposes. He wrote a fascinating article under the heading "The Mystery of the Pollen Theft" and this served as a very effective and inexpensive advertisement for my new daffodil.

In the *Incomparabilis* section a few seedlings that received awards were raised. Two varieties have conspicuous orange red cups—*Imperium* and *Helen Wills*, and *Debora* has a white perianth with orange yellow cup.

Some good *Barrii* varieties should also be recorded. These obtained awards of Merit—*Graziella*, a charming flower with undulating apricot crown on a pure white perianth, and *Pygmalion* with a flat orange crown on a round, pure white perianth.

Successes in the *Leedsii* section were *Calypso*, *Clio*, *Genève Miramar*, and *Sigrid*, mostly of the giant *Leedsii* type on long stout stems and with perfectly shaped flowers. Those mentioned all received awards of merit.

The only *Poeticus* varieties to be mentioned are *Aglavaine* and *Anitra*, both with orange red cups.

The above is only a selection of the many hundreds of *Narcissi* seedlings raised.

GLADIOLI were one of the firm's specialties from the beginning. About 1845 a series of *ramosus* seedlings was put on the market and very favorably received by the horticultural press.

In the early flowering section some good novelties were produced shortly before the World War—*Abundance*, *Bloemhof* (two Awards of Merit), *Bridesmaid* (A. M.), *Centenary*, *Darling*, *Sunset* and *Sweetheart*.

Since the introduction of the first *gandavensis* varieties, the firm had grown extensive collections of all known varieties, later including also the *Lemoinei* and *nanceianus* varieties. In 1910 I introduced seedlings of my own raising, including the following which received award of merit or awards for garden merit—*Cajanus*, *Comet*, *Frithjof*, *Harold*, *Mercator*, *Regina*, *Triumphator*, *Vesta Tilley* and *Victor*. Besides I may refer to *Papillon*, *Prometheus*, *Sultane* and *Zephir*, which were very favorably described in a report of the Department of Floriculture, New York State College of Agriculture in 1915.

More extensive is the list of *primulinus* hybrids. In obtaining these I wanted to keep the charming character of this species, the loose arrangement of the medium sized flowers on the stem. Any attempt to produce large-flowering varieties was intentionally avoided. The varieties put on the market were incorporated in many collections and they each obtained one or more awards, first class certificates or awards for garden merit—*Adonis*, *Aglaja*, *Alaska*, *Argus*, *Atalanta*, *Athalia*, *Citronella*, *Daphne*, *Eurydice*, *Hermione*, *Hesperia*, *Icarus*, *Juno*, *Laetitia*, *Latonia*, *Medea*, *Medusa*, *Niobe*, *Papilio*, *Psyche*, *Puella*, *Salmonia*, *Satyr*, *Scarletta*, *Sibylla*, *Sphinx*, *Thecla*, *Vanessa*, *Vinula* and *Xanthia*.

All these varieties covered a very large range of colors including very soft pink, pure yellow, deep orange and dazzling scarlet.

HIPPEASTRUM. The Hippeastrum collection of the firm was one of its glories in the middle of the 19th. Century. About 40 years ago it was renewed by the addition of the well known Van Eeden collection. It was greatly improved when the raising of hybrids was systematically carried on after the acquisition of superior forms from other sources. In 1919 the collection gained the highest award at a Haarlem show—the large medal offered by Queen Wilhelmina. The strain distinguished itself by large round upright flowers of glowing colors and also included faultless pure white hybrids, without any trace of green. These have later become familiar in several trade and private collections, but in 1919 they were still exceedingly scarce.

CRINUMS. I was fortunate enough to obtain two hybrids which proved to be of the highest decorative value for the garden, in a protected position. Both were the result of crossing *C. longifolium* with *C. Moorei*—*Harlemense*, soft rose, and *Krelagei* (Plate 111), soft pink passing to white, (Award of Merit). Both varieties were highly praised by specialists.

DAHLIAS were another specialty for over a century. Often the firm issued special dahlia catalogues in the days when the old-fashioned full double show varieties were popular. In the period of the Cactus dahlias, extensive collections were grown and the tubers sent all over the world. The firm yearly won high prizes at horticultural shows including the Queen's Medal in 1917, and the special prize for the best novelty in 1916. Although a single-flowered variety raised by the firm had obtained an Award of Merit at Amsterdam in 1891, the regular raising of seedlings did not start until the year 1900. The first success was a series of strong-stemmed, large-flowering Peony dahlias, of which the following varieties may be mentioned:

The 1913 series included *Borneo*, *Celebes* (A. M.), *Centenary*, *Java*, *Malvine*, *Moonlight*, *Orange Queen*, (F. C. C.), *Pink Beauty* (A. M.), *Rosy Morn* (F. C. C.), *Snow White* (F. C. C.), *Sumatra* (F. C. C.) and *White Lady* (A. M.).

The 1914 series was dedicated to five Bavarian Princesses who had visited the firm's nurseries a few years previously—*Princess Adelgunde*, *Princess Gundelinde*, *Princess Helmtrud*, *Princess Hildegard* and *Princess Wiltrud*.

In 1916 two other newcomers were added to the list—*Cunera* (A. M.) and *Inca* (A. M.), and in 1917, *Amboina*, *Moor* (A. M.), and *Surinam* (A. M.). The last additions were *Orient* and *Orange Sun* (A. M.).

Meanwhile the *Collarette* dahlias had been successfully improved and a series of novelties, all distinguished by long, rigid stems and perfect flowers of various shades, was offered in 1917. The chief varieties were *Aria* (A. M. and awards for garden merit), *Barcarolle* (F. C. C. and A. M.), *Gavotte* (A. M.), *Melody* (A. M. and award for garden merit), *Minuet*, *Rhapsody* (A. M.), *Sonata* (two A. M. and award for garden merit), *Tarantella* (A. M.). In 1919 the following were added—*Adagio* (A. M.), *Largo*, *Symphony* (A. M. and award for garden merit), and in 1920 *Andante* and *Presto*. Last, but not least, were the three latest

additions (1921) *Fuga* (F. C. C. and award for garden merit), *Prelude* (A. M. and award for garden merit) and *Trio* (two A. M.).

Apart from the Single dahlias produced many years ago and referred to above, two distinct novelties should be added to the introductions of 1918, which were very favorably received—*Dictator* (A. M.) and *Velours d'Utrecht* (two F. C. C.).

Meanwhile also some good Decorative varieties were raised, of which I mention *Golden Rain*, *Dove of Peace* (A. M. and award for garden merit) and the superior novelty for 1921, *King Harold*, which obtained three awards. At the same time the garden Cactus dahlia *Mrs. Krelage*, a very free-blooming pure white on long stems, was a great success. It obtained two F. C. C., the award of garden merit, and was generally recognized to be the best white Cactus up to that date.

Long stemmed dahlias are hard to exhibit far from home, because they quickly wither when cut. I therefore sent the flowers by aeroplane to London when I showed them there in September 1920. The flowers were exhibited in first rate condition and the British colleagues asked me how I had managed this. "Well, of course by sending the flowers by aeroplane," I replied. Although the daily air service between England and Holland had existed several months, this seemed not to have been sufficiently advertised; at least the fact proved to be unknown, not only to my British friends, who were greatly surprised, but also to *The Times*. In its columns the next morning the arrival of the flowers by air was related under the important events of the day.

BEGONIAS. The only novelties in Tuberous begonias raised in our nurseries belong to the strain of varieties with slender, gracefully drooping flower heads for hanging baskets. The double flowers are small and loose with pointed petals. They were first offered in 1917 in separated colors, red, orange, yellow, white, pink and salmon.

GLOXINIA. In 1916 the firm offered a set of gloxinias of its own raising, distinguished by large, well-shaped flowers of pure colors. Their names were *Amalthea*, *Cassiopea*, *Eurynome*, *Olympia*, *Pandora* and *Persephone*.

CANNAS. Four canna hybrids were offered in 1914 which were then improvements on the existing varieties. One of the series, *Willem I*, obtained an Award of Merit at Haarlem, the others were named: *Vander Duyn*, *Van Hogendorp* and *Van Limburg Stirum*.

I have still to refer to a lot of hybrids in the class of herbaceous plants.

ASTILBE. In 1920 four novelties were offered which were considered valuable additions to the assortment of the then existing white and pink astilbes—*Artemis*, rose; *Astarte*, soft lilac, and *Cassandra*, deep red. Each variety gained an award of merit at Haarlem. The fourth variety, *Virgo*, was pure white and a good forcer.

IRIS. I have always felt a predilection for this genus of plants that is so varied in shape and character and fills almost the whole year, starting with the earliest bulbous species in winter.

The firm had always grown very complete collections of all sections, and had introduced new species and varieties from everywhere. The collection of German irises, or *Iris barbata*, furnished me with the material on which to base the historical review of the section in Bulletin No. 2, of the American Iris Society, published in 1921.

Hybridizing did not start before the year 1910, as far as the *barbata* section was concerned. A few good results were obtained—*Queen of the Blues* (A. M.), *Phyllis* (F. C. C.), *Insulinde* (A. M.) and *Semiramis*.

KNIPHOFIA. Most of the older Red Hot Poker plants have very thick stout stems bearing large flower heads. Decorative as they are as garden plants, they lack the appropriate qualities for cutting purposes. Species imported later from South Africa had slender but firm stems and graceful flower heads. This led me to the production of a series of small, elegant varieties in the whole color range, already known in the genus. The varieties were first offered under the collective name of *K. gracilis*, which however proved to be an objectionable name, because there was a distinct species of that name. In 1916 the first series was offered, including the following varieties which have become very popular—*Golden Spire*, *Goldfinch*, *Goldflake*, *Jaune Suprême*, *La Citronnière*, *Orange Queen* (two Awards of Merit), *Prince of Orange* (two Awards of Merit), *Solferino* and *Sovereign*. In 1917 *Luna* (A. M.), *Nymph* and *Prince of the Netherlands* were added to the assortment. The latter was distinguished by an Award of Merit from the Royal Horticultural Society of London in 1921.

LUPINUS POLYPHYLLUS. The firm offered in 1918 and following years a few varieties of its own raising—*Ariadne*, *Diana*, *Isis*, *Juno*, *Mauve Queen*, *Minerva*, *Sky Blue* (A. M.) and *Venus*, the colors ranging from delicate pink to deep indigo blue.

PEONIES. The peony collections of the firm were very complete. Special catalogues were issued from time to time, and the edition of 1892 is a source of information for the history of the genus. In this catalogue I attempted to mention the raisers' names and the year of introduction of all of the varieties offered. These dates had never been published in such a complete manner before.

Novelty raising was not attempted until 1900. Only a few new varieties were added to the already very extensive assortments, but their quality was up to the standard. The following obtained awards.

Graziosa, single flowering, fiery carmine rose, golden yellow anthers (A. M.).

Niobe, rose with silver reflections (A. M.).

Koningin Emma, rosy pink, fading to pure white.

Prince of the Netherlands, bright carmine rose, with silver sheen.

Princess Juliana, an improvement on Eugénie Verdier; very strong stems (A. M.).



President Theodore Roosevelt at the Tully Flower Show, Harlem, 1910

See pages 26 and 42.



Photobureau Stevens, Haarlem

Queen Wilhelmina and Princess Juliana of Holland at the "Flora" Flower Show, IJmuiden, Holland, 1935
(The Queen is in white mourning dress on account of the death of the Prince-Consort Henry.)

Queen Wilhelmina, a first rate novelty in the style of the old *Reine Hortense*, but superior (two F. C. C.).
Sylvia, pure white shaded pale pink (two A. M.).

PHILOX DECUSSATA. A few phloxes were produced, which were included in the assortments of several firms. In 1914 I offered *Alphons Diepenbrock* (A. M.), *Bernard Zweers* (A. M.), *Mevrouw Noordewier* and *Mevrouw de Haan Manifarges*. These were additions to my former seedlings—*Clio*, *Feé*, *Mengelberg*, *St. Moritz*, *Viola*, *Viotta* and *Zenith* (A. M.).

The above is only a selection of the most important hybrids and seedlings obtained from many thousands of others. The raising of novelties has been a great delight to me, not only because of the fascinating expectation of the results, but more so on account of the satisfaction given by the production and distribution of new varieties, fit to beautify the gardens all over the world. Of course, many of these varieties have since been replaced by newer and better ones, but others are still among the leading trade varieties, or may become popular garden plants or forcing varieties.

PUBLICATIONS

During my stay at the Haarlem Latin School, I had the great advantage of a teacher of the Netherlands language who made much of exercises in composition and there I acquired the ease in writing which was of immense value to me later. In my student years I contributed articles to the students' weekly and their almanac.

Soon after entering business life, I started with papers on actual subjects in the bulb world, which were published in the Dutch Bulb Growers' Weekly. One of the leading features of those days was the publication of an Album with colored plates representing the best varieties for the general trade. Many years ago similar work had been sponsored by the late bulb firm of A. C. van Eeden & Co. at Haarlem. The new work was published by the firm of De Erven Loosjes under the auspices of the General Bulb Growers' Society. For trade reasons the names of the editors were not mentioned on the title. During the five years of publication there were four editors. However, of the four I was the only one who functioned during the whole publication of the work. The plates were all pictured by the Belgian flower painter Goossens, and lithographed by Severeijns of Brussel which was then the only special house for such work. The painter came to Haarlem during the flowering season and every flower to be figured was posed for him by the editors, who also prepared the text in four languages.

About the same time I was one of the five editors of the *Tijdschrift voor Tuinbouw* (Horticultural Magazine), a monthly in the Netherlands language, which was described as a scientific horticultural periodical. It contained elaborate studies and essays that were too extensive for the weekly periodicals, and it kept its high standard during five years. Unfortunately it did not meet sufficient appreciation and it died from

“solidity.” In this monthly I published studies on irises, dahlias, peonies, *Eucharis* and wrote various references on amaryllids—crinums, *Haemanthus*, *Hippeastrums*, nerines, etc.

I was also the editor of another monthly, “Krelage’s Bloemhof”, that was published for the purpose of maintaining the firm’s relations with its retail customers in Holland. It contained not only practical hints on the cultivation of bulbous and herbaceous plants but also longer articles.

In 1910 I wrote “The History of the Bulb Growers’ Society of Haarlem,” covering the first half-century of its existence, as a jubilee present to the members of this Society. It is a quarto volume with many illustrations, and contains reproductions of many documents on the development of bulb culture and trade during the period 1860-1910. In the last chapter I characterized the development of bulb culture in this period in the following terms,—

“The area devoted to bulbs increased from 600 to 8000 acres, and the yearly export from one to twelve millions of florins. The number of growers, not exceeding 300 in 1860 increased to 3000, and instead of 40 export firms, there were 170 in 1910. The average price for land suitable for hyacinth culture mounted from 7000 to 15000 florins per 2 acres, the yearly costs for labor from 150,000 to 2,000,000 florins, the number of laborers from 500 to 4000. Materials also considerably increased in price.

“This steady progress is chiefly due to the enterprise and tenacity of the bulb growers and exporters themselves. Intensively devoted to his profession many a modest laborer worked himself up to foreman, and after struggling under hard circumstances, has gained independence and prosperity. The sons, better instructed than their fathers, have elevated the standard and increased the reputation of the firms they now lead. Older firms, of well established fame, extended their working sphere, in proportion to the number of sons available for leadership or to the owner’s intelligence and perseverance. Old names, famous in the 18th and early 19th centuries, disappeared in the struggle for life. How many of these, who were then foremost, are now forgotten.”

The Society’s history of the next 25 years should have been written for the occasion of the 75th anniversary, but the finances did not permit the publication of an appropriate memorial book. This should have been far more extensive than the first volume because of the many important facts and economic crises that characterize this period. I therefore confined myself to a speech at the memorial day exercises in which I gave a brief review of this period in the Society’s history, and this oration was printed in the Society’s weekly.

In the next year the firm’s centenary was commemorated. At this occasion I distributed a volume to all connected with the firm and friends, entitled: “A Century of Bulb Growing,” in which I described the history of the firm, paying a tribute of thankfulness to my predecessors and my coöperators.

The third book that I published had nothing to do with horticulture. It contains a lecture held before a Haarlem club on “The History of a Debating Society, 1852 to 1899.”

My other publications were printed in various periodicals. It would be of no use to refer to these in detail here, in as much as they were written in the Dutch language. Partly these were notes on bulbous plants and their history, partly longer articles on horticultural subjects, such as the organisation of societies, economic questions, import and export interests, etc. I was often asked to write articles on the importance of bulb culture in economic periodicals or special issues of weekly and monthly reviews.

I contributed articles on bulbous plants to various horticultural periodicals of other countries, such as *The Garden*, *Gardeners' Chronicle*, *Revue Horticole*, *Gartenflora*, *Moellers deutsche Gartenzeitung*, *Gartenwelt*, etc. I mention here only the principal articles that appeared in English, French and German, and a few in Dutch, and that refer to plant genera or varieties.

On bulb culture in general:

- Bulb Culture and Export. (Commercial Holland, April 1919).
- Dutch Bulb Culture. (Holland Import & Export Trader, Oct. 1921).
- The Garden of Europe. (The Times, Holland Supplement, Dec. 6, 1921).
- Bulb Culture in Holland. (The World's Markets. R. G. Dun & Co., February 1923).
- The World's Garden. (Horticultural Supplement Algemeen Handelsblad, April 15, 1925).
- The Dutch Bulb Export. (Hollands Import & Export Trader, May 1926).
- Notes from Tulip Land. (Tercentenary Supplement Algemeen Handelsblad, Oct. 5, 1926).
- Bulb Cultivation and Trade in Holland. (Financial and Economic Review, Amsterdam Bank, April, 1929).
- Bloembollen voorheen en thans. (Old Times and Present Day Bulbs) (Floralia, October 3, 1930).

On Hyacinths:

- Uit de geschiedenis der Hyacinth. (From the Hyacinth's History) (Floralia, August 17, 1923.).

On Tulips:

- Breeder Forms of *T. Gesneriana*. (The Garden, December 9, 1893).
- Darwin Tulpen. (Gartenflora 1894 page 481-2).
- Les Tulipes Dragonnes. (La Revue Horticole, June 16, 1894).
- Darwin Tulips versus English Breeders. (American Gardening, July 21, 1900).
- Darwin Tulpen. (Die Gartenwelt, October 5, 1901).
- May-flowering Cottage and Species Tulips. (Journal Royal Horticultural Society London 1902).
- Hollandsche Eenkleuren. (Dutch Breeder Tulips) (Weekblad voor Bloembollencultuur, May 3, 1913).

The Darwins. (The Garden, November 24, 1917).

Nouvelles tulipes hybrides. (La Revue Horticole, Nov. 16, 1920).

Vielblütige Tulpen. (Moellers deutsche Gaertnerzeitung, Aug. 21, 1932).

Het gouden jubileum der Darwintulp. ('The Darwin Tulips' Golden Jubilee) (Weekblad voor Bloembollencultuur, July 19, 26 and Aug. 2, 1935).

On Narcissi:

Narcissus semipartitus plenus. (Tijdschrift voor Tuinbouw, 1896).

Narcissus General Gordon. (The Gardeners' Magazine, Oct. 1, 1910).

On Irises:

Irissen (Irises). (Tijdschrift voor Tuinbouw, 1899).

The Development of Tall Bearded Irises in the 19th Century. (Bulletin No. 2 American Iris Society, January 1921).

Histoire et development des Iris des Jardins. (Les Iris cultivés. Conférence de Paris 1922).

Les races horticoles des Iris bulbeux: sections Xiphium et Juno. (Les Iris Cultivés, Conférence de Paris 1922).

Iris germanica. (Floralia, August 18, 1922).

On Lilies:

Dutch Lilies. (Journal R. H. S. 1901).

Lilium philippinense. (Die Gartenwelt, Febr. 15, 1908).

Lilium regale und *L. myriophyllum*. (Moellers deutsche Gaertnerzeitung, Nov. 20, 1920).

Some Lilies First Distributed on or from the Continent of Europe. (Lily Yearbook R. H. S. 1933).

On Gladioli:

Hybrid Gladioli. (The Garden, February 27, 1892).

The Origin of Garden Gladioli. (Garden and Forest, November 4, 1896).

Vroegbloeiende (early) Gladiolus Koningin Wilhelmina. (Tijdschrift voor Tuinbouw, 1896).

Früher Gladiolus Koningin Wilhelmina. (Gartenflora 1897 p. 169-170).

On Dahlias:

Dahlias. (Tijdschrift voor Tuinbouw, 1897).

Kraagdahlias. (Collarette Dahlias). (Floralia, April 30, 1920).

Nieuwe Kraagdahlias (New Collarette Dahlias). (Floralia, November 11, 1921).

The Development of the Dahlia. (Report International Congress of Horticulture, Amsterdam, 1923).

On various plant genera:

Drei schaenblühende, mexicanische Zwiebelgewaechse. (Three charming, mexican bulbousplants) (Wiener ill. Gartenzeitung, 1891).

Crinum augustum (Tijdschrift voor Tuinbouw, 1897).

Het geslacht *Eucharis* (The genus *Eucharis*). (Tijdschrift voor Tuinbouw, 1896).

The Hardiness of Flame Flowers (*Kniphofia*). (The Garden, January 23, 1892).

Hardy Hybrid *Kniphofias*. (The Garden, 1892 II page 206).

Brunsvigia Josephinae. (Gardeners' Chronicle London January 22, 1938).

Mexican *Calochorti*. (The Garden, 1892, II page 146).

Calochortus. (Tijdschrift voor Tuinbouw 1898).

ORGANIZING AND LEADING HORTICULTURAL SOCIETIES

I evidently inherited my father's aptitude for organisation. Immediately after the latter's retirement from the presidency of the Bulb Growers' Society, I was invited to succeed him. I refused, however, in order to concentrate all my energy on my firm, but this did not prevent me from occupying the honorary secretariat of the floral committee of the Netherlands Horticultural and Botanic Society.

After six years, when I had reorganized and firmly established the firm, I no longer hesitated to accept the leadership of the General Bulb Growers' Society, and I also became a member of the board of directors of the Netherlands Horticultural and Botanic Society. The latter Society is composed of horticulturists and amateurs and it is the only national horticultural organization in the country and I was therefore often in touch with the Government and had to advise on many subjects. As a member of the board of directors I soon felt that this body was not properly constituted. As a rule only floriculture and arboriculture were more or less sufficiently represented on the board, while the interests of vegetable and fruit growing were neglected. I therefore planned the organization of a federation, comprising all horticultural societies, local, provincial, or national, and grouped in accordance with their objects into the sections—vegetable growing, fruit breeding, arboriculture, floriculture, bulb growing, and horticultural seed growing.

It took five years to accomplish this task. There was a rather strong opposition from various sides, until the Director-General of Agriculture declared that the Government urgently wanted the organization of one central horticultural federation, authorized to advise it on all horticultural interests. A government subsidy to further the purpose was also proposed.

The Netherland Horticultural Federation started in 1908 under the presidency of Director-General Lovink himself. I soon became acting vice-president and later served a few years as president, resigning in 1929. The federation did good work in its first period, but after the war it had to reduce its activity owing to lack of finances and the changed conditions.

Apart from manifold economic and social interests, the federation took care of the representation of Netherlands Horticulture at shows abroad. The system of collective exhibits, without firm names, but advertising the products of the bulb region, Aalsmeer, Boskoop and other centres as a whole, was adopted from the beginning and proved a perpetual success.

As a rule I was appointed president of the exhibition committees for this participation abroad, and served as such in Berlin (1909), London (1912), San Francisco (1915), St. Petersburg (1914), at the Ghent "Floralies" in 1923, and 1928, at Paris in 1927, at Madrid in 1929 and at the World's Exhibitions of Antwerp and Liège in 1930. The Aalsmeer florists asked me to be their representative leader at Turin in 1929.

Careful preparation was needed to secure the success of the Holland sections at these international gatherings. Negotiations had to be carried on and concluded with the Government in order to obtain a modest subsidy, with the show committees abroad in order to guarantee the needed space in a convenient corner of the exhibition, and with railway, water or air transportation companies to secure the most favourable freight terms, etc. It was mostly a difficult, but a fascinating task, and the success which happily was always achieved served as the best reward to all those concerned. The collective participation of all branches of Dutch Horticulture at these shows in so many countries mightily stimulated the export of her products.

I may add that the exhibitions referred to above formed only a part of those with which I was connected as a member of the Jury. Since my father had acted as a Judge of Awards at all the leading international horticultural shows of his period, I automatically became his successor in these functions, when he resigned his activity on account of his advanced age. I started at The Chicago World's Fair in 1893, and acted as a juror in 1897 at Berlin and Hamburg, in 1898 at Ghent, in 1899 at St. Petersburg and Mont St. Amand, in 1902 at Birmingham, in 1903 at Ghent, in 1903 at Luxemburg, in 1904 at Dusseldorf, in 1905 at Paris, in 1907 at Mannheim and Dresden, in 1908 at Ghent, in 1909 at Berlin, in 1910 at Paris and Brussels, in 1911 at Florence, in 1912 at London, in 1913 at Breslau and Ghent, in 1914 at St. Petersburg. The World War stopped the horticultural show activity for many years. Since the resumption of this activity I was a member of the jury in 1923, 1928 and 1933 at Ghent, in 1929 and 1927 at Paris, in 1925 at Brussels, in 1928 and 1930 at Antwerp, in 1930 at Liège, and this year I hope to attend the Ghent "Floralies" for the 8th time as a juror during a period of 40 years.

It is always a great pleasure to welcome old friends from various countries at these gatherings, but alas, how many of them have passed away!

Before the World War the Kingdom of the Netherlands had adhered to the free trade principle, which was responsible for a long series of prosperous years. Nevertheless certain industrial centres in the country pleaded for protection, and from time to time bills were proposed in

Parliament to satisfy them, but without success. Such a bill was also proposed in 1911 and the president of the Horticultural Federation, an ex-leader of a Department was in favour of it and tried to convince the board of directors that the Federation ought to declare in favor of the protection bill. As vice-president of the Council, I led the opposition and won out. The majority of the board voted against protection and I presented the petition to Parliament, which with many efforts from other sides, served to hold off, at least for the near future, the threatening protective tariff. The president of the Federation resigned and was succeeded by a freetrade member of Parliament.

Although in our days free trade seems to belong to history, I still consider it to be the ideal economic system. The free trade period in Europe was a happy and prosperous one, which is not likely to return, although many political leaders in various countries declare that they would like to have the system back, if only their neighbours could be prevailed upon to do the same. The neighbours express the same wish, but no country seems to take the initiative in stopping autocracy, protective tariffs, and quotas, that all are war instruments and serve to maintain the contrasts and conflicts between nations instead of restoring peaceful, friendly, and unlimited commercial relations all over the world.

At the beginning of the World War the Netherlands Government solemnly declared its neutrality and urgently requested its subjects to act accordingly. Repeatedly however travelers for horticultural export firms did not live up to this ideal when representing their firms abroad. They criticized the belligerents of one side or another, and gave the false impression that their country did not maintain its neutrality.

The council of the Netherlands Horticultural Federation invited me to make an appeal to the horticultural interests of Holland and to point out the necessity of remaining neutral in all circumstances, especially so, since Holland after the war would have the task of reconciling the former belligerents by offering them her good services for restoring commercial and friendly relations. I did so in a general assembly of the Federation on March 4, 1915. The speech, published in the daily papers, was translated and printed in the Gardeners' Chronicle of London and so became known in France, where the reaction was quite unexpected. "How dares Mr. Krelage, who is an old friend of so many French horticulturists, defend neutrality?" asked the leading horticultural trades paper of France. "One should be with us or against us, there is no other choice." Such statements left no room for any discussion. Fortunately a few years later the same paper behaved very kindly to me, all being forgiven and forgotten.

INTERNATIONAL HORTICULTURAL TRADE'S ASSOCIATIONS

In 1910 during the Jubilee Flower Show at Haarlem, the horticultural trade's associations of Belgium, England, France, Germany, Holland and Luxemburg sent representatives to a meeting in Haarlem,

where they founded the International Horticultural Trade's Association. The object was to foster the mutual interests of the horticultural trade, to register new varieties, to reduce or remove trade barriers, to promote uniform trade terms etc.

Every year a meeting or conference was held, and the board of directors changed yearly. I was elected president for the year 1911/12 and presided during the conference in London in 1912. It was then decided to have a permanent secretary's office in Holland and the secretary of the Netherlands Horticultural Federation was appointed as secretary. This outcome was due to my success in obtaining a yearly subsidy from the Government of Holland in case the Union would establish its secretariat at the Hague. Without any doubt the Union would have become very influential, if these conditions could have been realised. Holland, being the most important producing horticultural country in Europe, would have been justly entitled to this position, and it would have fulfilled it seriously and actively. Unfortunately the World War interfered with this project. The relations were thoroughly disturbed, and after the war the old position could not be maintained. The French Horticultural Trade Association started a new international federation with England and Belgium, excluding all the other former adhering countries. Informal negotiations between the British organization and myself led to Holland's entry into the federation, and at the conference held in 1925 in Haarlem, the German Horticultural Association was admitted on Holland's proposal. I was chairman of the conference at the Hague in 1922, occupying the presidency of the federation for the year 1921/22.

Although the yearly meetings of the leaders of the horticultural trade in various countries were a decided advantage, it soon became clear that satisfactory results could only be expected in comparatively normal times.

As soon as the world depression, beginning in 1929, introduced an ever increasing series of manifold international trade barriers, the federation appeared to be powerless and useless. Every country looked only after its own interests—exactly the same regulations were proposed for which the neighbour was blamed. One country after the other severed her connections with the federation and all activity practically ceased.

LEADING BULB GROWERS' ORGANIZATIONS

In 1903 I accepted a seat in the Council of the Bulb Growers' Society. I was made vice-president the next year, and in 1906 was elected president of the Society. I served in this capacity until 1920 when I decided to devote myself more intensively to my firm. I was again elected president in 1922. After two periodical re-elections by unanimous vote, I retired in December 1935 in my 67th year.

A membership in the Society is practically indispensable to every bulb grower or exporter. On the weekly bulb exchanges, open to the members only, the mutual transactions between growers and exporters are settled. They are obliged to submit their differences to a court of arbitration, appointed by the Council of the Society, which provides



Jan de Graaff, Sandy, Oregon

See pages 26 and 195

White Trumpet Narcissus—Mrs. Ernst H. Krelage

cheap, quick and expert justice. They may show their novelties every week during the whole year in the Society's building at Haarlem to all their fellow-growers and exporters. They profit by the nomenclature-work of experts carried on in the trial garden of the Society where thousands of tulip varieties and other bulbs, correctly named, are flowered under ideal conditions. They receive gratis the Society's valuable weekly containing a profusion of technical and other information.

During the 28 years of my presidency, the Society went through periods of great prosperity and deep depression. In 1910, 1925 and 1935 glorious flower shows were held of ever increasing importance, the semi-centenary and the three-quarter centenary were celebrated under favorable auspices, but the periods of the World War and the world depression caused serious difficulties to the bulb industry, and added to the Society's problems.

When I started as president, the Society had 2400 members in 30 local sections, in 1931 this number had increased to 6000 members in 65 sections, but at the end of 1935 it was again reduced to 4000 in 60 sections owing to the crisis which was responsible for the reduction of the cultivated area and the number of growers.

The flower show of 1910 introduced a new type of floral exposition. Since its beginning in 1860 the Society had held yearly shows, especially of Hyacinths in pots in March. From 1875 to 1905 these shows, on a larger scale, were held every five years. The best of this series took place in 1885 commemorating the Society's 25th birthday. After that year the exhibits diminished and it became obvious that the type of show no longer met the requirements. Having visited the open ground exhibitions of Hamburg (1897) and Dusseldorf (1904), I suggested the idea of a spring show in the open air during the flowering period of the bulbs from middle of March to the middle of May combined with a temporary show in a building. In this I was supported by other younger growers. A proposal to this effect was rejected by the Society and the old type of show was staged in 1905. When, however, the visitors from overseas, who acted as jurors, expressed themselves in favor of the new type of show proposed, the Society's general meeting did not hesitate any longer and accepted the open air show of two months, to be held in 1910 at the semi-centenary of the Society.

The well known horticultural centres of Aalsmeer and Boskoop coöperated and their exhibits contributed to the decorative character of the show. It was very instructive to bulb growers. They could observe the right and the wrong color combinations, the decorative use of their bulbs, and receive other valuable suggestions of importance to them. The show stimulated the sale of bulbs abroad and at home. Visitors came from everywhere, and the jury was truly international. The Royal Family paid repeated visits and past-president Theodore Roosevelt was received by an enthusiastic gathering (Plate 93).

The World War affected the Dutch bulb trade seriously. The first years were relatively normal but in 1918 the export was reduced to less

than half the normal value and it appeared that the bulb growers might lose their means of subsistence. The whole bulb district was in danger. It was then decided to grow vegetables in huge quantities on the bulb farms and to try to salt these in a cooperative factory. The Government allowed the exportation of these products in exchange for the collective furnishing of large quantities of potatoes, beans, carrots, etc., at low figures for the food supply of the country. The Government requested that the factory to be put under the management of the already existing semi-official war committee for the bulb district of which I was chairman, and so to my own amazement I became leader of a vegetable conserving industry. The quality of the products of this factory was so superior that it could command the highest market prices from the belligerent countries. This system saved the bulb district from ruin. In one year two millions of florins could be distributed among the growers who had furnished their products to the factory. When peace was reestablished, the bulb export soon revived.

The consequence of the World War prevented the organization of the next show until the year 1925. The exhibition was held in the beautiful park of Heemstede near Haarlem and it was twice as large as the first show. The effect of the hundreds of thousands of flowering bulbs in the grounds was marvellous and the horticultural press of the world unanimously expressed its satisfaction. Special ambassadors were sent from the U. S. A.—Mrs. Francis King officially represented the Garden Club of America, and the American Rose Society—Mr. John T. Scheepers, the Horticultural Society of New York and the Society of American Florists and Ornamental Horticulturists. Mrs. King acted as president of one of the international Juries. As president both of the Show Committee and of the Bulb Growers' Society, I organized several dinners and receptions to which ambassadors of foreign countries, state ministers and other high officials were invited. I tried to give these festivities the character of social functions, and I was sometimes blamed for it by bulb growers, who evidently did not understand that my aim was to place the bulb growing industry, in the appreciation of officials, on the same level as that of other industries. I was convinced that by doing so, the influence of the bulb growers with the authorities would be increased, and their standing raised in the eyes of the public.

In 1924 the Society held a memorial assembly to celebrate the centenary of its founder's birthday. In an oration I sketched my fathers life and career. For many years it had been planned to erect a large hall for the Society and its institutions and offices as a memorial tribute to its founder, but the necessary financial support failed and it was not until 1928 that the plan was realized. In that year the

Krelage Building was completed and dedicated by the Dutch Minister of the Interior and Agriculture.

The new building, situated near the centre of Haarlem, occupies a surface of 2 acres, and affords an ideal home for the society. A spacious hall, the largest in town, was built for the weekly bulb exchange, where as a rule every Monday 800 to 1000 members mutually deal in bulbs and allied products. Another hall is devoted to the weekly shows of new and interesting varieties of bulbs all the year round, judged by expert committees, which are entitled to award certificates and medals. On the ground floor are also the room for the Court Arbitration, the secretary's offices and the president's room. On the first floor are the council and committee rooms, and the extensive library, for the greatest part presented by me on my retirement as president. It contains remarkably complete sets of such valuable horticultural periodicals as *The Gardeners' Chronicle* (of 1841), *The Garden*, *Gartenflora*, *Flore des Serres*, *Belgique Horticole*, *Illustration Horticole*, *Revue Horticole*, etc.

A trial garden, in which numerous trials and nomenclature tests are under way, surrounds the building.

The acquisition of this splendid society building was a great satisfaction for me. For years there had been differences in the Society as to its location. Haarlem, Heemstede and Hillegom were rivals. Although my secret wish was that the building should be erected in Haarlem, it has always been stated that I was impartial in leading the debates in several general meetings of the Society, where the matter was discussed. If I succeeded in obtaining the realization of my wishes, this result may be attributed to my fixing and pushing forward the decisive vote at a moment, when a majority in favor of Haarlem was assured.

The third great show was held in 1935 in connection with the 75th birthday of the Bulb Growers' Society. It was again much larger than the former show and was visited by 750,000 visitors within two months, which was a record for floral fêtes in Holland. The grounds were open also evenings when they were phantastically illuminated. Queen Wilhelmina consented to be Patron of the Show, a favour Her Majesty had never granted before to any exhibition. The Queen twice visited the show, accompanied by Princess Juliana (Plate 94), and the German Ex-Kaiser also paid a visit. Aalsmeer and Boskoop again coöperated, and the various horticultural societies all postponed their own shows in favor of the great "Flora" exhibition. From U. S. A. again came Mr. John T. Scheepers, this time as official representative of the Governor of the State of New York, the Horticultural Society of New York, and the Society of American Florists. He offered the gold medal of the Horticultural Society of New York to the landscape architect of the show, Mr. H. J. Voors, the Society's secretary, for his grand achievements. Ten years before I had the honor of receiving the same distinction in connection with the 1925 show.

As a rule the society held two general meetings yearly. I never failed in preparing an elaborate opening address, in which I treated actual economic questions, the society organization or other matters. Many of these speeches, which were printed in full in all the daily papers, contained advice or remarks on government regulations. In this way a useful influence on public opinion was exercised and the interest in the bulb growing industry increased.

I have always endeavoured to centralize all interests of the bulb district as much as possible, but since one of the most characteristic qualities of the Hollander is his untamable spirit of independence, I have not succeeded in realizing this ideal in full.

I started by organizing the representatives of the Bulb Exporters Association, a smaller growers' society, and the special groups of hyacinth, tulip, narcissus and gladiolus growers, into a Central Committee under the leadership of my own Society. I thus obtained periodical gatherings where unified opinion could be formed on the principal items of actual interest in order to avoid contradictory action or advice to authorities.

This committee also administered the extra contributions, which all members of bulb societies have to pay in proportion to the land area they cultivate, for the promotion of collective propaganda abroad and for phytopathological research.

More than ten years previously I submitted a reorganisation scheme, which would bring all bulb growers and exporters together under one neutral council, leaving all groups and sections as intact as possible, but concentrating all vital decisions to the central council.

The time however was not ripe for this program, which could not be pushed forward. Then came the crisis and the inevitable Government regulations that reduced production and fixed minimum prices. These regulations had been solicited by the combined bulb societies, but the way they were executed by the Government officials caused great disappointment, and things doubtless would have been managed better if my concentration scheme had become effective in due course.

Notwithstanding the many drawbacks peculiar to the Governmental system of control, the results as a whole are satisfactory, but in my opinion they are only acceptable if temporary. I served in several official "crisis-functions," but these occupations ended when I resigned as president of the Bulb Growers' Society in December 1935.

I had already announced my intention to resign when I began my last five years' term. I thought it wise to leave the post to the younger generation, although my fitness had not diminished.

The Society gave me an impressive farewell in the last general meeting over which I presided. The Government was represented by a high official of the Department of Agriculture, and the Society, of which I was already a honorary member, offered me the honorary presidency. The members presented me with my portrait painted by the Hungarian artist Mendlik (Plate 90), and at a reception after the meeting a long file of authorities, representatives of horticultural societies, friends and others came to shake hands with the departing president.

The bulb exporters had been organized by my father in 1868 in an association which in the beginning met the requirements of the period, but did not satisfy the younger generation thirty years later. As soon as I had been accepted as a young member, I tried to reorganize the association into a more active and efficient body, but the older members refused their consent. With ten other firms I then left the old association and in 1901 was one of the founders of the Bulb Exporters' Association which has since developed into a most influential corporation. It has its own intelligence and collecting department, a bureau administered by a lawyer as secretary, a forwarding office in Holland, and a branch office at New York. It serves the export interests in the best possible manner.

My organising tendencies also led me to organize the horticultural trade in other branches, especially floriculture and arboriculture, into an inland association, on the same, but of course a more modest basis, than the Bulb Exporters' Association for the export trade. This Netherlands Horticultural Trades' Association still continues its work to the benefit of the members. I was the first president and on my retirement, was appointed honorary member.

PUBLIC SERVICE

Apart from my horticultural activity, I was often called to perform other duties. In 1908 the citizens of Haarlem elected me as a member of the Town Council. It was characteristic for those days that I was the candidate of six political parties who accepted me without asking any previous declarations or promises. My only opponent was a socialist. I resigned in 1915 when I could no longer spare the necessary time for this work.

In 1915 I was appointed by the Government as a member of the Court of Appeal for State Contributions at Haarlem, a responsible and trustworthy task which I occupied until the year 1930.

During my stay at Amsterdam University one of my fellow-students in biology, William Commelin Scholten, died. His parents, whose only son he was, wishing to found some memorial, consulted me, who had known their son well. After consulting with my father I advised the foundation of an institute for genetics, because I knew that young Scholten's ambition had been to devote himself later to applied botany in relation to horticulture. Purposely I did not advise the founding of a laboratory for phytopathology because I considered this to be a task for the state. It was so urgently needed that it would come as a matter of course. The parents, however, accepted the advice of Professor Hugo de Vries in favor of a phytopathological institute. It was put under the direction of Dr. Ritzema Bos, and inaugurated in 1895. I was invited to become a member of the board of directors and served as secretary from 1906-1935. In 1906 the Government organized a State Phytopathological Institute at Wageningen, under the direction of Prof. Ritzema Bos, and at the same time withdrew the subsidy from

the Amsterdam Institute. The Scholten Institute, under the genial leadership of Professor Johanna Westerdijk, and now situated in Baarn near Utrecht, has become one of the most important centres of this science, and is regularly visited by numerous students from other countries.

Already in 1902 I was elected as a member of the Haarlem Chamber of Commerce and a few years later I became its vice-president. Institutions of this kind were not of special importance in those days for they had an exclusively advisory task and did not hold their meetings publicly. My proposal to change this system in order to revive public interest was rejected. I resigned in 1912, but after the reorganization of the Chambers of Commerce which increased their influence and gave them certain rights and faculties, I was chosen as one of the representatives of the bulb organisations. I was at once elected general president of the Haarlem Chamber, and served for ten years (1922-1932).

Every year in the first session of the Chamber I read an address giving a review of the previous year and my view on the economic conditions of the moment.

My function as president of one of the five most important Chambers of Commerce in the Netherlands led to my election as a member of the board of directors of the Netherlands section of the International Chamber of Commerce. I also became a member of some special international committees, such as that on trade barriers, in which I always tried to foster the free trade principle.

Owing to my experience in exhibition matters the Netherlands Government appointed me as its delegate to the Diplomatic Conference on International Exhibitions held in Paris in 1928, where the rules for the organisation of world's fairs and other international exhibitions were fixed.

A similar official function was accorded to me by the Government as its representative at one of the assemblies of the International Agricultural Institute in Rome in 1928 in connection with an International Conference on Plant Diseases.

My economic conviction in matters of international trade relations made me during a long period of years an active member of the board of directors of the Netherlands organisation for free trade. In this capacity I became honorary member of the London Cobden Club.

During the World War the Netherlands' Government organized a semi-official organisation for the control of exports in which all economic groups were represented. I was appointed as one of the horticultural representatives in the council.

In my own town I was often invited to serve as member or chairman of committees organized for various purposes.

A few years after the Rotary movement started in Holland, a club was organized in Haarlem, of which I was a charter member. I soon became president for one year, and acted as governor of the 59th District of Rotary International in the year 1930-1931. I visited the Great Chicago Jubilee Rotary Conference in 1930 and during two years was a member of the European Advisory Committee.

CONNECTIONS WITH THE UNITED STATES OF AMERICA

The firm of E. H. Krelage & Son had relations with the United States since the first years of the 19th. Century when bulbs were yearly sent to public auctions in various cities of America. Later, during a series of years, the bulbs were sent directly to such firms as John Milton Earle, Worcester (1831); William Prince & Sons, Flushing (1835); Henry A. Dreer, Philadelphia (1844); Ellwanger & Barry, Rochester (1841); R. Buist, Philadelphia (1850); Geo. C. Thorburn, Newark (1852), etc., and in 1859 the first special American edition of the wholesale bulb catalogue was issued.

In 1893 my father was invited by the Netherlands Government to act as a Judge of Awards for horticulture at the Chicago World's Fair, but he did not accept on account of his advanced age. The Government then appointed me, although, at the age of 24, I seemed rather too young for this responsible post. I acted as a judge during a month in Chicago together with Geo. Nicholson of Kew and Professor Wittmack of Berlin. After completing my work, I made a round trip over Yellowstone Park, Van Couver, California, Utah and Colorado back to Chicago and from there to Niagara, Boston, Philadelphia, Washington and New York.

Not until 1922 did I visit the States for the second time. The bulb exporters sent me with Mr. Warnaar as delegates to Washington in connection with the hearing which preceded the embargo on narcissi three years later.

The announcement made in 1922 by the United States authorities, concerning the proposed embargo on narcissi bulbs to begin in 1925, caused great embarrassment among the daffodil growers of Holland. Their stocks were practically free from diseases and insects and they feared that the bulbs might suffer from an embargo based on the health condition of narcissi bulbs grown in other European countries. In order to secure information on the state of health of the totus albus narcissi grown in the important centre of Southern France, the Society asked Prof. van Slogteren (Plate 96), the renowned phytopathologist, of the Lisse Laboratory, and myself to visit the farms in that district. As we found the presence of the eelworm disease in certain places, we gave information and instructions to the growers on how to fight the pest. In this way we won the confidence of the bulb growers in the district, who were ready to loyally coöperate to free the farms from pests. The American embargo however could not be avoided and it came into force on the announced date.

My third visit to the States took place in 1930 when I was present at the Jubilee Convention of Rotary International in Chicago as governor nominee of the district of Holland. It was a sensation for me to compare the Chicago of 40 years ago without any skyscrapers or autocars with the Chicago of today.

My interest in peony and iris culture and my historical studies on the development of the garden varieties, brought me in contact with Mr. Wister, the enthusiastic founder of the American Iris Society. He solicited from me an elaborate article on the "History of Bearded

Irises'' for one of the first Bulletins of the Society. The historical notes published in my firm's special Peony Catalogue (1892) were reproduced in the publications of the American Peony Society.

EPILOGUE

Reviewing my life I cannot be thankful enough for the many privileges I enjoyed. I know my failures and my shortcomings. I succeeded only partially in realizing my objects and so I am not quite satisfied with the result of my work. The prevailing feeling however is that of gratitude and contentment.

DECORATIONS, HONORARY MEMBERSHIPS, AND PERSONAL MEDALS

DECORATIONS

Knight of the Netherlands Lion Order.
 Officer of the Orange Nassau Order.
 Knight first class of the House of Orange-Order.
 Knight Commander of the Leopold II Order of Belgium.
 Officer of the Belgian Crown Order.
 Knight of the French Legion of Honor Order.
 Officer of the French Order for Agricultural Merits.
 Officer of the Italian Crown Order.
 Knight 3rd class of the Imperial Russian St. Stanislas-Order.

HONORARY MEMBERSHIPS

Honorary president, General Bulb Cultural Society of Holland.
 Royal Netherlands Horticultural and Botanic Society.
 Netherlands Horticultural Trade's Association.
 Royal Agricultural and Botanic Society of Ghent (Belgium).
 Syndical Chamber of Belgian Horticulturists.
 Chrysanthemum Club of Belgium.
 National Horticultural Society of France.
 Royal Horticultural Society (London).
 Iris Society (London).
 American Iris Society.
 American Amaryllis Society.

PERSONAL MEDALS

Horticultural Society of New York (1925).
 Haarlem Chamber of Commerce (1931).
 Large Nicolaas Dames—Medal (1935).
 William Herbert Medal, American Amaryllis Society (1938).



Miss Ida Luyten (Photo, H. Berssenberger, Den Haag), upper left; Prof. Dr. E. van Slogteren (Photo, Truus Knopper, Heemstede), upper right; the late C. Ludwig (Photo, de Graaff, Sassenheim, Hillegom), lower left; Th. M. Hoog (Photo, Weijert van Zanen, Haarlem), lower right. See pages 48, 56 and 59.

AMARYLLID CULTURE IN HOLLAND

ERNST H. KRELAGE, *Holland*

In giving a review of amaryllid culture in Holland, attention will be mainly centered on *Hippeastrum* and closely allied genera, for which the Dutch bulb nurseries have been renowned over a long period of years. Narcissi are one of the three most important items in the Holland bulb market and a record of their cultivation would require an entire volume of Herbertia.

All other genera of the family, including those now transferred from the Liliaceae to the Amaryllidaceae, which are known as cultivated plants, have long been specialties with some Dutch bulb growers, who export them to their customers abroad and also furnish them to their colleagues, who do not grow these items themselves. In this paper however these genera will not be dealt with and these will be left for later treatment. I will confine myself to the most characteristic representatives of the family—the *Hippeastrums* and closely allied genera.

All of these amaryllids, with a few exceptions, had to be introduced from other parts of the world. The Hollanders often received new plants before anyone else, owing to their early regular navigation to their colonies all over the world—the Malayan Archipelago, which they still occupy, Ceylon, Tasmania, and New Zealand, Cape of Good Hope, Brazil, New-Amsterdam (New York) and many other areas of minor importance.

We often find in old Dutch horticultural books figures and descriptions of newly introduced plants that were never described before and were soon lost because their cultural requirements were unknown.

Haemanthus multiflorus was figured as early as 1612 by Emmanuel Sweerts in his *Florilegium*, under the name *Satyrium* from Guinea. This book was the first illustrated bulb catalog, for the author announced at the back of the title page that the bulbs figured may be purchased from him either at the yearly fair at Frankfurt am Main or in his shop at Amsterdam. *H. multiflorus* was reintroduced in 1878 under the name of *H. Kalbreyeri* by James Veitch & Sons who had received it from their collector Kalbreyer.

Hippeastrum equestre was figured and described by Paul Hermann, Professor of Medicine and Botany and Director of the Botanic Garden at Leyden, in 1698 under the name of *Lilium Bella Donna*. The engraving gives a perfectly exact and charming impression of the species figured.

I possess a fine drawing in water color of the same species, by the flower painter Laurens Van der Vinne (1712-1742), made in 1737 at Leyden. As to whether or not this picture was made from a plant of the original stock is unknown. The species was repeatedly lost to cultivation to reappear as many times. In 1710 it became known in England, and it may then have been reintroduced in Holland. After periods, when it was lost sight of, it was considered a novelty and was newly named and described. It is not surprising that it has more than half a dozen synonyms in botanical literature.

Sometimes, in the early literature, only a huge bulb is figured with the remark that it has not as yet flowered. Some of these plants can easily be recognized, others not with certainty. This is not a serious loss however for the regular cultivation and trade in tropical and similar bulbs did not begin until the latter part of the 18th Century.

As far as amaryllids are concerned, the Haarlem bulb firms had splendid opportunities of securing good stocks of valuable species in 1789 for in that year a French officer, La Brousse, returned from the Cape of Good Hope and settled at the Lankhorst estate, Heemstede near Haarlem. He brought a large stock of bulbs from South Africa with him which he planted in the estate garden, and there he showed them to the Haarlem bulb growers. He succeeded in getting exceedingly good prices for his merchandise. Among these bulbs were several amaryllids and these doubtless formed the original stock of species offered in the Haarlem bulb catalogues of the period.

The amaryllids of La Brousse included a giant bulb which did not flower until the year 1805. It was described as *Amaryllis gigantea* by Van Marum, later sold to the French Empress Josephine, and dedicated to her as *Brunsvigia Josephinae* by Redouté, who had not seen the first description of the plant.¹

Catalogues issued by Haarlem firms in the early years of the 19th. Century, and previously, are extremely scarce. A few copies from various firms are in my possession. Amaryllids were offered by the firms of Voorhelm & Schneevoogt, Joh. Rosenkrantz & Sons, A. C. Van Eeden & Co., Hendrik van Eeden & Co., Groenewoud & Voorhelm, H. Polman Mooy and E. H. Krelage.

The species offered were often the same and it may be supposed that they did not all grow these themselves, but obtained the bulbs, if wanted, from another colleague who had them in stock. The amaryllids were not a very important article, until the advent of the *Hippeastrum* hybrids.

EARLY AMARYLLIS BREEDERS

Since the appearance of the remarkable *Hippeastrum Johnsonii* and *Ackermannii*, the raising of hybrids was taken up in several countries and Holland had a large share in it. The firms that had collections with international reputations were De Graaff Brothers at Leyden, V. Schertzer & Sons, A. C. Van Eeden & Co. and E. H. Krelage & Son, at Haarlem.

They all had special warmhouses built for amaryllis exclusively and their flowers were almost yearly the pride of the flower shows in Holland. The collections were often visited during the flowering period by representatives of British and other amaryllis growers who often purchased the best hybrids at high prices.

De Graaff Brothers (at Leyden). The predecessors of this firm (thus named from 1863 until its amalgamation with S. A. van Konijnenburg & Co.) cultivated *Hippeastrums* since the year 1790. The first

¹See page 132.

species known in Holland were *vittatum* and *equestre*. After the introduction of *H. fulgidum* and *crocatum* (both closely allied to *H. rutilum*) in the first decade of the 19th. Century, these species were intercrossed with *vittatum* and *Johnsonii*, the hybrid between *Reginae* and *vittatum* raised by the Lancashire watchmaker Johnson in the same period. The seedlings obtained excelled in dark colors, but the flowers were small. A hybrid which later proved to be of great importance in the further development of Hippeastrums was *Graveanum* (the right spelling evidently ought to be *Graaffeanum*). This was probably obtained by crossing *Johnsonii* with *fulgidum* or an allied form.

Simon A. de Graaff (1840-1911) who, with his brother, succeeded their father Jan de Graaff in 1863, started hybridizing about the same time, using the larger flowering species and hybrids, then known, including *psittacinum*. By crossing the latter with *Graveanum*, he raised the famous *Empress of India* which afterwards became an important factor in the production of some of the best types by the British firm of James Veitch & Sons. Many others of De Graaff's seedlings were purchased by British firms to improve their stocks of Hippeastrum.

The Leyden nurseries, which half a century ago had partly the character of a botanical garden, have been reorganized into one of the largest bulb farms of Holland with branch farms in England and U. S. A. Hippeastrum culture has been entirely dropped.

Valentine Schertzer & Sons, at Haarlem, were already established as bulb growers and exporters in 1730. In the middle of the 19th Century, when their firm was owned by H. D. Kruseman (1814-1879), one of their specialties was amaryllis culture including the raising of hybrids. The firm's collection had a high reputation and gained many high prizes at flower shows between 1860 and 1880. Their bulb catalogues of that period do not mention variety names, and the hybrids were offered only with colour descriptions. In later years they abandoned amaryllis culture and only kept the seed trade section of the business.

A. C. van Eeden & Co., at Haarlem. The van Eedens were known as florists since the beginning of the 17th. Century. A hundred years later there were four firms of the name, all descendants of a common ancestor who had acquired fame as a florist. In 1812 Arie Cornelis van Eeden, after having been associated with Hendrik van Eeden, started business on his own account. He had an excellent reputation as a grower and for his general knowledge of everything connected with gardening in Holland. A later owner of the firm was A. C. Groenewegen, (1844-1892) who established the firm's renown for amaryllis growing. Their collection competed successfully at shows between 1865 and 1890 and many of their hybrids were among the best of the period. After Groenewegen's death the collection was sold and partly came in the possession of E. H. Krelage & Son.

E. H. Krelage & Son, at Haarlem, started Hippeastrum growing during the first quarter of the 19th Century. They had an extensive collection and issued a descriptive catalogue of Hippeastrum in 1863 in which over 350 hybrids were described and offered including the best seedlings of the late F. Boon.

The Haarlem bulb show of 1895 proved that the collections of the Dutch firms were far from up to date. A brilliant collection sent by Messrs R. P. Ker & Sons of Liverpool topped them all. These fine plants were retained in Holland and contributed greatly toward the improvement of the Dutch Hippeastrum collections.

Henry Nehrling in an article in *Garden & Forest* of May 19, 1897 enthusiastically praised the Krelage hybrids—"A large number of gigantic hybrids of the finest form and beautiful colors have recently been introduced by Mr. E. H. Krelage of Haarlem, Holland. Just now (April 10th.) the following are in flower with me." After detailed description of some hybrids he concluded: "These hybrids compare well with the others now in flower with me. They are vigorous growers and easily managed. The scapes are usually three feet high. The form of the flowers, the narrow channeled leaves and color of the bulbs show that Mr. Krelage has had a way of his own in producing these grand hybrids."

Since the 90's Krelage Hippeastrums could therefore again claim to be the foremost in quality. In 1919 they obtained the highest prize of honor, the Queen's Large Medal at the Haarlem show. The strain then contained faultless brilliant scarlets and crimsons, pure whites and pinks, and the last traces of the objectionable green in the throat had disappeared. Shortly afterwards the firm sold its collections.

In the years 1880-1900 the firm grew an extensive collection of *Clivias*, containing practically all the hybrids of the period raised by Reimers of Hamburg and the Belgian firms. A hybrid raised by the firm with large round erect flowers of orange salmon color with light yellow centre, named *Natura Artis Magistra*, received a First Class Certificate by the Netherlands Horticultural and Botanic Society in 1891.

Other firms. About 1890 three other Dutch firms cultivated amaryllis—A. H. Ingenhousz van Schaik at Voorschoten, J. W. Daudey at Haarlem and J. Kouwenhoven at Warmond, but their collections remained in existence for comparatively short periods only.

Before referring to present day Hippeastrum culture in Holland, it seems appropriate to describe the methods of growing in use half a century ago. The large sized flowering bulbs were grown in low "spanroof" show houses and the smaller sized ones in brick pits, where they remained until they flowered; the best ones were then removed to the show houses.

Tan bark could then be easily and plentifully obtained in Holland. This is the crushed bark of the oak tree and is used for tanning cow hides. When tan bark is put on a heap it slowly decomposes and gives off a steady heat. It was used in plant houses to provide a cheap plunging material which kept a steady bottom heat for a long time. The pots in which the Hippeastrum bulbs were planted, were plunged in this material. It was also used for covering the pots with a layer of about ten inches thick.



W. S. Warmenhoven, upper left; J. M. C. Hoog, upper right; the late C. Ludwig and some of his white amaryllis (Photo, de Graaff, Sassenheim, Hillegom), lower, note that Mr. Ludwig is to the right. See pages 56 and 59.

As the methods of heating by warm water pipes gradually became more popular, the growers abandoned the use of tan bark and laid hot water pipes in the beds thus producing bottom heat that could be regulated at will. Other growers however, preferred to use the fallen leaves of oak and beech trees, which, if brought on a heap, also give off a steady and gentle heat for several months.

The bulbs were wintered in a hot, dry place and were potted about the end of March. Since the bulbs were grown for export in October, they had scarcely seven months in which they were expected to complete their growth.

The seeds were sown in pans and left undisturbed for two or three seasons. After that period the seedling bulbs were potted separately and grown in the way indicated above.

AMARYLLID CULTURE TODAY

At present amaryllid culture in Holland is carried on chiefly by three firms and the managers (Plates 96 and 97) in each case have kindly furnished me with particulars about their achievements.

C. G. van Tubergen, Jun., at Haarlem not only grows a famous collection of *Hippeastrums*, but also is a successful raiser of amaryllid hybrids (See portraits of the Messrs. Hoog, Plates 96 and 97). This firm also pays attention to *Hippeastrum* species and varieties requiring a minimum of artificial heat and which with due care and attention in mild climates may be grown outside. The old hybrid *H. Ackermannii* is one of the best in this class. In English gardens not far from London large, very free-flowering clumps of this *Hippeastrum* hybrid grown on narrow borders in front of warm walls, often form a very striking subject in summer, with their tall spikes, crowned with two to three or four crimson-red flowers of tubular form. In Van Tubergen's nursery it grows and increases with great freedom. Here it is planted in a deep sandy soil in beds in a house devoted to the culture of Cape and Chilian bulbs, and is kept in winter just above the freezing point. This house which is never shaded, but well ventilated, receives much solar heat in summer.

The winter-flowering *H. aulicum* is one of the easiest *Hippeastrums* to grow. It requires but little heat, is more or less evergreen and it flowers during the dull winter months. The blooms are of a good size, scarlet with greenish base. It is one of the few *Hippeastrums* that can permanently be grown in the dwelling-room, where with a little care and attention it produces every winter its bright colored flowers. This species has been hybridized with *H. reticulatum striatifolium*. The latter is a tender hot-house species. The hybrid however proved to be a plant easy to grow, with luxurious deep green silvery white striped leaves and attractive flowers of carmine-rose. The hybrid does not require much heat.

The new *H. candidum* is described and figured, in the Botanical Magazine, and it is supposed to require much heat, but in Van Tubergen's nursery it grows vigorously in the cool-house described above; unfortunately it flowers but very sparsely and it makes few or no offsets.

Hippeastrum rutilum is easily grown and free-flowering. This species is very attractive in spring with its elegant, slender flower spikes that grow about a foot high and bear four orange colored flowers, marked with green in the center. If in the course of time it will be possible to raise different colored varieties of it, retaining the elegant habit and small sized flowers, it will no doubt become very popular. Unlike most other *Hippeastrums* this species increases rapidly by offsets that adhere to the mother bulb.

Last summer in Van Tubergen's nursery much attention was centered on *H. (Phycella) phycelloides*. Bulbs of this species had been received in the previous year from their collector in Argentina. This species which grows and increases with great freedom produces numerous flowerspikes in succession throughout the summer months. The flowers are of small size, funnel shaped, bright red with protruding yellow stamens. If this can be hybridized with the allied *Habranthus pratensis*, quite a novel race of highly attractive and uncommon summer-flowering bulbs for the warm bulb border will be obtained.

Amaryllis Belladonna (Ait.) and *Brunsvigia*. Most of the beautiful autumn-flowering *Amaryllis Belladonna* (Ait.) varieties are tender. Although, they may be grown outside, in northern climates, if care is taken to protect them during severe winters, the amount of flowering usually leaves much to be desired. There is however one exception and that is the variety, which for a long time has been cultivated in Dutch nurseries under the name of *Amaryllis Belladonna* (Ait.) *purpurea major*, a variety which in French gardens goes under the name of *rosea perfecta*. If the bulbs of this variety become well established, they form big clumps and always push up their flowers spikes in the autumn. These bear several rosy flowers that are tinged with purple after ageing.

This variety on account of its free-flowering character and robust constitution has been used as a starting point for improvements. From an Australian grower, the firm sixteen years ago received a consignment of bulbs of a hybrid between *Amaryllis belladonna* (Ait.) and *Brunsvigia Josephinae*. This hybrid was formerly also raised by another grower and was named *A. belladonna* (Ait.) *Parkeri*, after the raiser. This hybrid produces very tall spikes, crowned with a very great number of large, bright rosy flowers with a yellowish-white center, and it is very beautiful. Unfortunately, owing to the influence of *Brunsvigia Josephinae*, although it will live in our gardens, it will only produce its flower spikes after an exceptionally warm and dry summer. The variety *purpurea major*, crossed with this bigeneric hybrid, gave a number of varieties, all great improvements on the original form, four or five percent being pure white. The latter are especially notable for exquisite beauty and charm. Among *Amaryllis belladonna* (Ait.) varieties grown in Van Tubergen's nurseries, is also a very large-flowered form with flowers of deep crimson-rose. This was received a good many years ago from the late J. H. Elwes, the author of the magnificent publication "Monograph of the Genus *Lilium*". The above named hybrids, out of the old *purpurea major* X *Parkeri*, again crossed with Elwes' *belladonna*, which received the name of *rubra major*, constitute a strain of very tall,

many-flowered belladonnas, some of which owing to the influence of Elwes' *rubra major* produce many-flowered umbels with large flowers, of a warm, rich rosy-carmine with a yellowish throat. All of these however require a very warm, sheltered situation, for the foliage develops during the winter months. In Van Tubergen's nurseries they are planted in beds in a lofty, well-ventilated, sunny house, where frost can be excluded during the winter. In the autumn, when the *belladonna* hybrids are in flower, this house presents a really magnificent sight.

In the same nurseries about 25 years ago, a cross was effected between *Brunsvigia Josephinae* (mother parent) and a good variety of *A. Belladonna* (Ait.). A few seeds were harvested and whereas under good cultivation *A. belladonna* (Ait.) X *Brunsvigia* will flower in five or six years if raised from seed, the reverse cross *Brunsvigia Josephinae* X *A. belladonna* (Ait.) cannot be expected to flower until the bulbs are some twelve to fifteen years old. This hybrid which was called *Brunsdonna Tubergeni*, has been figured and described in the Gardeners' Chronicle and has created much interest for it is one of the very few bi-generic hybrids in bulbous plants. Owing to the influence of the mother parent, *Brunsvigia Josephinae*, these hybrids are of slow growth and do not increase freely, but they are very beautiful when in flower. This hybrid produces a stem with a very large umbel of flowers in which clearly the influence of *Brunsvigia* can be traced. One of the varieties bears flowers that are colored exactly like *Passiflora kermesina*.

According to the rules adopted to name plants, both hybrids, the *A. belladonna* (Ait.) X *Brunsvigia* and the reverse cross, *Brunsvigia* X *A. belladonna* (Ait.), should bear the name given to the latter hybrid—*Brunsdonna*. Horticulturally however there is such a great dissimilarity between these two groups of hybrids, that Messrs. Van Tubergen, as soon as the available stocks are large enough, intend to offer them under two headings, calling the hybrids out of *A. belladonna* (Ait.) X *Brunsvigia*, *Amar-Brunsvigia*² and the reverse group, *Brunsdonna*, giving varietal names to the numerous varieties in each group.

Ismene. Another group of amaryllids to which great attention is being paid are the *Ismenes*. Baker in 1888 made *Ismene* a subgenus of the Genus *Hymenocallis*, to which they are very closely related, but horticulturally, and apparently also botanically, they form such a distinct group by themselves, that it is certainly correct to retain the name *Ismene* (founded by Salisbury) for them. One of the best known species no doubt is *I. calathina*, but its drawback is that it is not free-flowering. Out of a series of crosses effected between *I. calathina* with the free-flowering hybrid raised by Mr. A. Worsley, which he called *I. festalis* (*I. calathina* X *Elisena longipetala*), one specimen was selected which in all points closely resembles the old *I. calathina* but bears a larger flower, is of a much more vigorous constitution, increases rapidly and is very free-blooming. This has been called *Ismene Advance*.

²Since Dr. Uphof, page 101, of this volume, has shown that the valid name for *Amaryllis belladonna* (Ait.) is *Callicore rosea* Link, the editor suggests *Corevigia*, or *Callivigia* as more appropriate names for the bigeneric hybrid. The name *Amar-Brunsvigia* is also somewhat clumsy.—Ed.

The above mentioned *I. festalis* no doubt is one of the choicest bulbous plants that have lately been raised. Owing to the influence of *Elisena longipetala*, this hybrid produces highly refined pure white flowers. The cup is somewhat deflexed and the petals are rather curiously twisted. In favored localities, when planted in a border in front of a heated plant-house, this hybrid will live out of doors, and will grow into handsome clumps which never fail to produce tall spikes in the summer, crowned with fantastically shaped, pure white flowers, that are highly fragrant. The Peruvian golden-flowered *Ismene* (*I. Amancaes*), with its magnificent clear yellow flowers, striped with green, has been known for a long time, but is rarely seen in gardens for its constitution is delicate. *Ismene calathina* crossed with *I. Amancaes* gave birth to a vigorous growing hybrid with sulphur-yellow flowers which Van Tubergen raised and called *I. Sulphur Queen*. Other crosses are still in course of observation.

All the *Ismenes* from a horticultural point of view are exceedingly valuable, not only because they are really beautiful plants, but also because the list of bulbs that can be offered during the winter and spring months in shops and in seed-warehouses is somewhat restricted. The *Ismene* bulbs however are of handsome appearance and will keep in good condition for several months, provided the temperature does not fall below 50 degrees F.

Ludwig & Co., at Hillegom specializes in pure white *Hippeastrum* seedlings and possesses a superior strain of pure whites. The late partner of the firm, C. Ludwig (Plates 96 and 97), who worked twenty years in hybridising amaryllis, is responsible for this result.

W. S. Warmenhoven (Plate 97). The name Warmenhoven has been associated with *Hippeastrums* for the last twenty years. The firm of W. Warmenhoven & Sons of Hillegom owned a superior collection and was a regular and successful exhibitor in Holland and Belgium and the new concern of W. S. Warmenhoven, "Zonnewende", Hillegom, deserves attention because it sponsors the application of the vegetative method³ (by means of cutting and scooping the bulbs similar to the method used to increase hyacinth bulbs) of propagating stocks of superior hybrids. These are characterized by large flowers of round, ideal shape and dazzling pure colours of every shade, including pure whites, clear violet shades, light Havana brown with dark bases, delicate pinks and many others. From these various hybrids only the very best individual plants are carefully selected for vegetative reproduction. In this way the superiority of the coming stocks is fully guaranteed. At the "Winterflora" show held at Haarlem during last February, the firm exhibited an outstanding group of their hybrids, and demonstrated the value of vegetative reproduction of amaryllis in a most convincing manner. The group was superior in every respect and probably contained the very best *Hippeastrums* now in existence.

³The Scientific research on which these practical results are based was most successfully performed by Miss Ida Luyten in the laboratory of Prof. Blaauw in Wageningen in 1926. I need not refer to these achievements, because they have been treated in detail in an article by Miss Luyten herself (Plate 96) in Volume 2 of this Year Book (pages 115-122).

Growing Bulbs from Seeds. The modern methods of growing *Hippeastrums* from seeds differ greatly from those used in the 19th Century. Instead of leaving the young plants in seed pans, they are put into small pots about two months after the seeds have been sown, which is generally done early in May. These seedlings after eight or nine months of careful cultivation in a moderately warm house, develop into nice young plants with bulbs of the size of a hazelnut and in January are again repotted into 2½ to 3 inch pots. If these plants are grown in a suitable structure with ample solar heat and good feeding, they will have become strong young bulbs, 1¾ to 2¼ inch diameter, at the age of twenty months by the next autumn. Sometimes however, the young seedlings are not potted separately, but are planted out in benches in the houses, in order to save labor.

Formerly it was the aim of *Hippeastrum* growers, to produce a product as varied as possible, since *Hippeastrums* were then generally sold in small collections of various colors. Now that the cultivation of *Hippeastrums* has become better understood, and it is now possible to produce, large, flowering-sized *Hippeastrum* bulbs within a period of only three years, *Hippeastrums* are being raised in large quantities in order to meet the trade demands. The trade now distinctly wants large quantities of bulbs of self colors—deep scarlet, orange-salmon and pure whites being preferred.

By judiciously selecting seed parents that closely resemble each other in growth, habit and flower color it is possible in many instances to secure seedlings fairly true to type.

H. Boegschoten. To complete these notes, mention should be made of a distinct strain of *Hippeastrums*, raised about 1920 by Mr. H. Boegschoten, head gardener on a private estate near Haarlem. He made use of the small-flowering species *H. rutilum* and obtained a strain of hybrids with medium sized flowers in dark red shades, and which is remarkably free-flowering. These hybrids have never been distributed to the trade.

IN MEMORIAM—GEORGE YELD

Early in April of this year the news spread in horticultural circles that Mr. George Yeld had died April 2, 1938, at Orleton, England, at the age of ninety-five years. Mr. Yeld's profession was that of a master in private schools for boys in England. In his earlier days he was an alpine climber of some note. Since about 1890 his avocational interest in garden plants was keen. During the last half of his life his service and contributions to horticulture were of special merit.

Mr. Yeld was apparently the first person to obtain seedlings of daylilies (*Hemerocallis*) by deliberate pollination. He states (Rep. Third Conference Genetics, 1906) that his interest in hybridizing daylilies was aroused when he first saw plants of *Hemerocallis Middendorffii* in bloom and considered the possibility of hybridizing plants of this species with plants of the Lemon Daylily (*H. flava*). The first of his seedling daylilies was exhibited in 1892. This plant was propagated and named the *Apricot Daylily*. Today this clone is in culture and is to be ranked as an excellent plant in the class of semi-robust stature, early flowering, and cadmium-yellow flowers. In 1906 Mr. Yeld summarized the early history of the development of horticultural daylilies and listed nine of his own seedlings that had been named for propagation. Other daylilies obtained as seedlings by Mr. Yeld continued to appear, the last shortly before his death.

The list of all daylilies produced and named for culture by Mr. Yeld, of which the writer has record, is as follows:—*Ambler*, *Apricot*, *Aurelia*, *Beauty*, *Bretwelda*, *Chrysolite*, *Corona*, *Estmere*, *Flame*, *Francis*, *Gelasma*, *Halo*, *J. S. Gaynor*, *Magnifica*, *Meg*, *Miniken*, *Miranda*, *Moidore*, *Moonlight*, *Omphale*, *Orange Vase*, *Pyrrha*, *Radiant*, *Sayda*, *Sica*, *Sirius*, *Tangerine*, *William Dean* and *Winsome*. Several of these clones, especially *Estmere*, *Tangerine* and *Apricot*, will long be regarded as plants of outstanding merit in their respective classes.

Mr. Yeld was also concerned with breeding bearded irises and of his seedlings mention may be made of *Asia*, *Memory*, *Neptune*, *Sunshine*, and the highly rated, *Lord of June*.

For many years Mr. Yeld was identified with the activities of the Royal Horticultural Society. He served on the Floral Committee and on the Joint Iris Committee of this society. In 1925 he was awarded the Victoria Medal of Honor in Horticulture by the Royal Horticultural Society.

A. B. STOUT,

ANNOUNCEMENT—GEORGE YELD MEDAL FOR
DAYLILY VARIETIES

The American Amaryllis Society has founded the George Yeld Medal, named in honor of the late George Yeld, which is to be awarded each year to the most outstanding and valuable daylily observed by a committee composed of the Chairman of the Daylily Committee, and the Chairmen of the Regional Daylily Trial Collections. The medal will be awarded for the first time in 1939, or 1940.

BETTER PLANTS AND ANIMALS⁴

S. H. YARNELL,

*Texas Agricultural Experiment Station
A. & M. College of Texas*

To the laymen interested in plant and animal improvement the 1936 and 1937 Yearbooks of the United States Department of Agriculture are a happy departure from the established procedure.⁵ The bulk of both volumes is devoted to progress in the development of "Better Plants and Animals" and to an insight of the scientific principles involved. While the 1937 volume is of particular interest to horticulturists, there are two chapters in the 1936 Yearbook that should by no means be overlooked. They are "A Glossary of Genetic Terms," and "Heredity Under the Microscope" by J. H. Kempton.

Every crop and domestic animal of importance to American agriculture has received attention, and the improvement of each is discussed by one or more specialists of the Department. An immense amount of information of value to the breeder is gathered together. The treatment is based on a survey of the genetic or germ plasm resources of our varieties of fruit, ornamental, and crop plants and breeds of animals. The comparatively recent organization of breeding work on a scientific basis permits a rather full account of early progress along this line in America. Present activities are recorded in detail, including their location, personnel, lists of varieties and breeding stocks, methods employed, and results being obtained. In addition there is a surprising amount of supplementary information such as chromosome lists, wild species of possible value, bibliographies, and the status of breeding work in other parts of the world.

Of especial interest to flower lovers is the chapter in the 1937 volume "Improvement of Flowers by Breeding" by S. L. Emsweller, Philip Brierley, D. V. Lumsden, and F. L. Mulford. This, in itself, is an enormous field. As an introduction to the subject, the scientific aspects of flower breeding are discussed. Attention is called to the value of disease resistant strains, to the effect of length of day on flowering, to the possibility of increasing the cold resistance of winter-hardy perennials, and to the desirability of supplementing the germ plasm resources of our present stocks with introductions from other parts of the world. The section on the technique of breeding is illustrated by drawings of the different types of flowers, and includes mention of special methods such as grafting a style from the pollen parent onto that of the seed parent where a cross is especially difficult. Mass selection is compared with line breeding. Then come discussions of hybridization, mutations as a source of new types, artificial methods of obtaining the different kinds of mutations, and "What the study of cells contributes to flower breeding." Figure 14 gives an excellent idea of what chromosomes look like when dividing, during the formation of pollen grains.

⁴Contribution No. 938, Popular Series, Texas Agricultural Experiment Station, approved by the Director March 28, 1938.

⁵Year Book of Agriculture, 1936 and 1937. Government Printing Office, Washington, D. C.

Amaryllis is the first flower group considered as such. The development of interest in the different species of *Amaryllis* (syn. *Hippeastrum*) is followed and interspecific hybridization considered. Attention is called to the work of the American Amaryllis Society in collecting and distributing information on this whole group of plants and in sponsoring national shows. The Bureau of Plant Industry has been breeding amaryllis since 1909, producing varieties of superior size, form, and color.

Daylily breeding began in the early nineties with the introduction of "Apricot" by George Yeld in England. A. B. Stout of the New York Botanical Garden has led in recent years, both in the production of new varieties and in a scientific study of the breeding problems, such as self-sterility and inter-compatibility, and the large number of genetic factors contributing to the production of desirable types.

Unfortunately it is impossible to more than list the other flower groups receiving special attention in the chapter on flower improvement. They are china-aster, canna, carnation, chrysanthemums, dahlia, gladiolus, iris, lily, nasturtium, rose, snapdragon, stock, and sweet pea. In the appendix there is a 14-page account of "Genetic studies on ornamental plants" which refers to no less than 111 genera. A bibliography of 564 titles that does not appear in the Yearbook itself has been published in the Separate of this chapter (No. 1591). For this reason it might be better for those whose interest is limited to flower improvement to secure this, together with the Separate entitled "Fundamentals of Heredity for Breeders" (No. 1605) rather than the complete yearbooks. They are for sale by the Superintendent of Documents, Washington, D. C. for fifteen cents each. The latter publication is a complete reference book in itself and contains the following articles: "Fundamentals of heredity for breeders" by E. N. Bressman, "Vegetative reproduction" by J. R. Magness, "A chronology of genetics" by Robert Cook, Editor of the Journal of Heredity, and "Studies in the behavior of chromosomes" by A. F. Blakeslee of the Department of Genetics, Carnegie Institution of Washington. With such information at hand the production of improved varieties both as a vocation and as a pastime should receive permanent stimulation.

WILDER'S "THE GARDEN IN COLOR"⁶

The publishers of this book were fortunate in securing the services of the late Louise Beebe Wilder in the preparation of the text and the arrangement of the color plates. However, it is unfortunate that no mention is made of the fact that the originals had previously appeared in Camillo Schneider's *Gartenschoenheit* (Berlin).

The plan of the book is excellent. There are four sections corresponding to the seasons, and outstanding plant subjects are grouped under each of these. The natural color reproductions in most cases are

⁶Louise Beebe Wilder, *The Garden in Color*, The Macmillan Company. New York. 1937.

satisfactory, but occasionally there is a plate that is somewhat "off-color." On the whole the attempt is successful, and we are grateful for this unified treatment of color in the garden covering the entire year.

The amaryllids are given due attention. In the spring section, *Narcissus*, *Golden Spur* and *Allium narcissiflorum* are illustrated, and *Galanthus* is referred to in the text. *Hemerocallis aurantiaca major* and *Agapanthus africanus* are pictured in the summer section, but *Lycoris squamigera* is an outstanding omission in the autumn section. However, *Leucojum*, *Sternbergia*, and *Brodiaea* are mentioned in the text.

In the winter section, *Clivia*, narcissi and hybrid amaryllis (formerly called *Hippeastrum*)⁷ are illustrated. Although the South American *Amaryllis* (formerly called *Hippeastrum*) appear in plates 282 and 283, the text states that "Amaryllis is a South African bulb," and the rest of the discussion is devoted to the South African species, which is not pictured, and is in fact a late summer and fall blooming species that is not cultivated under glass in winter. The reader is referred to Dr. Uphof's article⁷ for a clearer understanding of this classic "mix-up" in nomenclature.

Such minor discrepancies as pointed out should not detract from the work as a whole for the color values are the important consideration. From this standpoint, the book will find a warm reception from every garden enthusiast.

—Hamilton P. Traub.

⁷See Dr. Uphof's article on pages 101 to 109 of this volume.

IMPRESSIONS OF FLORIDA DAYLILIES— WINTER 1937-38

ETHEL P. DEWEY, *New York*

Florida offers the winter visitor some blossoms of *hemerocallis* as late as November and early December. These are not as might be supposed late-flowering plants blossoming for the first time but rather such favorites as *Soudan*, *Cinnabar* and others which are producing their fourth group of flowers. In response to the warm weather of peninsular Florida daylilies when properly cared for generously give four times more pleasure to the lover of *hemerocallis* than they do in the North.

Florida however has not become daylily conscious as yet and it was not until February that a search for plants was finally rewarded in the extreme south portion of the State. A lone plant raised its' lovely flowers to the sunshine from the bottom of an artificial sunk-hole south of Cocoanut Grove on the estate of Col. Robert Montgomery, and two weeks later a small planting was located at "Four Ways" the home of Arthur Curtiss James. The flowers in bloom were of light yellow shades only.

A few miles further South on the old Homestead Road a very good display of daylilies was seen in the gardens of Mrs. C. C. Cole. The plants were strong and healthy with good foliage and plenty of flowers although the range of color was limited to shades of yellow and light orange.

(Continued on p. 69)



*The William Herbert Medal; first awarded in 1937
to Arthington Worsley*



Fraser's, Inc., Pomona, California

See pages 69 and 83.

Presentation of the first Herbert Medal to Arlington Worsley by proxy—(from left to right) Mrs. Leonard Swetts, Mrs. Hugh Evans, Hugh Evans, Cecil Houdysbel, Mrs. Cecil Houdysbel and W. M. James. (Pomona, Calif., Sept. 23, 1937)
Plate 99

PRESENTATION OF THE WILLIAM HERBERT MEDAL TO ARTHINGTON WORSLEY—1937

The ceremony of presenting the first William Herbert Medal to Arthington Worsley of England occurred at 2 p. m., September 23, 1937. This was the opening day of the Fourth National Amaryllis Show, at Pomona, California.

This ceremony was succinct and brief, and took place on the stage of the great Agricultural and Horticultural Hall, before the thousand or more people in the hall. It was one of considerable historical importance. The recipient, Arthington Worsley, is everywhere known and revered by amaryllis lovers.

The following named members of American Amaryllis Society were called to the stage by Cecil Houdyshel: Mrs. Leonard Swetts, Mrs. Hugh Evans and W. M. James. Mr. Hugh Evans, born, educated and reared in England, English to the core, yet thoroughly Californian and an outstanding figure in Southern California horticulture had been chosen to represent Mr. Worsley, who could not be present.

Cecil Houdyshel then delivered the following presentation address:

Mr. Evans, Members of the American Amaryllis Society and Flower Lovers.

It is a satisfaction to feel that we are addressing not only the few members of the Amaryllis Society here present, but also through the next issue of *Herbertia*, the entire membership.

For the information of those present who are not members of our organization we will explain that the American Amaryllis Society is a group of flower lovers who have specialised in collecting and studying the group of bulbous plants known as the Amaryllidaceae. Our membership is scattered thruout the entire world and includes many great names. Names of famous plant breeders like that of Richard Diener and Fred Howard who are present today; Lord Aberconway, President of the Royal Horticultural Society, the greatest of all plant societies, and several of its distinguished members; the du Ponts whose Amaryllis collections are famous.

It is our pleasure and honor today to represent the American Amaryllis Society and to confer a worthy award upon an outstanding, devoted worker.

In the realm of human efforts those who have added most to knowledge, to culture and even to our general well being and comfort have often gone unrewarded. Indeed, the world's most valuable members work for the love of that which they do. They do not go on a sit down strike. Often they receive no wages.

We are today paying tribute to one of these voluntary workers, Mr. Arthington Worsley, of Isleworth, England. Regarding the nature of his work with Amaryllids we can best paraphrase the tribute paid him by Lord Aberconway in the 1936 *Herbertia*, the Year Book of the American Amaryllis Society:—

“As long ago as the beginning of this century when a discussion of Amaryllids took place the name of Arthington Worsley at once occurred to the mind. So well had he become known for the large number of wild species he had accumulated, for his knowledge of them and his skill in their culture that he was, about that time, elected one of the small body of honorary members of the Royal Horticultural Society—an honor bestowed on only a very few distinguished horticulturists, and was appointed a member of its Scientific Committee.”

Mr. Arthington Worsley was educated as a Civil Engineer and has followed that profession through most of his long life. Naturally his profession carried him into many parts of the world. In most parts of the world various genera of the Amaryllidaceae are found indigenous, and Mr. Worsley had ample opportunity to carry on his avocation.

Mr. Worsley, explaining what first drew his attention and devotion to the Amaryllids, says that one idle day he strolled into a neighbor's greenhouse and saw there a *Hippeastrum* in full glory. This led inevitably to a life time of study and devotion to them. In all the countries he visited he studied the plant life and collected among other things a great many bulbs of this group. His travels and his collections placed him in a most favorable position to study amaryllids. He became the authority on their culture, botanical classification and relationships. In the pursuit of this interest he grew many hybrids, among them a splendid red flowered *Crinum*, and also nerines, *Brunsviga*, *Amaryllis*, *Zephyranthes* etc. Some of these are intergeneric, some are interspecific hybrids. One of these, *Ismene festalis*, founded a new race of hybrids. We are proud to have growing in our garden not only the original *festalis* but some of its later improvements.

I regret that time does not permit more than a very brief reference to Mr. Worsley's accomplishments. In addition it must suffice to say that Mr. Worsley has been chosen by the American Amaryllis Society to be the most worthy recipient of this, the first Herbert Medal.

This is a beautiful bronze medal. On one side is a likeness of the revered Dean Herbert. On the other side is a *Hippeastrum* and the inscription “Awarded to Arthington Worsley, 1937, for eminent service.”

Mr. Evans, you have been chosen to receive this medal and to see that it is transmitted to Mr. Worsley, because you are yourself a distinguished English gentleman and an outstanding figure in the horticultural interests of Southern California. Therefore accept and transmit it with the admiration, the acknowledgement of our debt to him and all good wishes for many more years of life and happiness to Arthington Worsley.

Mr. Houdyshel then handed the medal to Mr. Evans who in accepting it replied briefly and suitably.

He complimented the American Amaryllis Society on the very excellent work it is doing in popularizing the plants of this large group; in promoting research of cultural methods, propagation methods, breeding, discovery and dispersal of new or rare species.

The adoption of this policy of the American Amaryllis Society, said Mr. Evans, of giving an award in the form of a medal bearing the name and the likeness of Dean Herbert, is a most happy and significant one.

Many times those who create, explore, discover, contribute to and dispense knowledge go unrewarded. Emoluments could not sufficiently reward them. This beautiful medal is an emblem of a thought held in the minds of the members of this society. In a way the Society is vicar to all who love flowers. Only this could be a real reward for work such as that accomplished by Mr. Worsley.

Mr. Evans in accepting the medal for Mr. Worsley expressed the belief that in the nature of things it would meet his highest appreciation.

In the photograph of the "Medal Presentation," (Plate 99) from the left of the picture to right are Mrs. Leonard Swetts, Mrs. Hugh Evans, Hugh Evans, Cecil Houdyshel, Mrs. Cecil Houdyshel and W. M. James.

IMPRESSIONS OF FLORIDA DAYLILIES—WINTER 1937-38

(Continued from p. 64)

Mentioning definitely the locations of these gardens is with the idea of showing that daylilies may be raised successfully even as far South as tropical Florida.

Neither along the East Coast nor in south central Florida were any plants of daylilies in evidence. Therefore it came as a surprise to find near Orlando in central Florida a garden with a large section devoted to the raising of *hemerocallis* species and hybrid seedlings. There at Mira Flores were fine plants having a wide range of color, and year old seedlings were beginning to show blooms of pale fulvous very definitely tending to approach good shades of pink. Also very noticeable were such deeper reds as *Vulcan* which had blossoms several shades lighter in color than in the North.

At Lakemont Gardens in Winter Park, the new variety *Araby*, introduced last year, was in blossom. The planting of daylilies on the muck-land in this section last year resulted in a greater change in *Soudan* than in any of the other hybrids used in the experiment. Those who saw the results report this daylily grew to a height of five feet with blossoms at least half as large again as it normally shows.

The trial garden at the Florida Agricultural Experiment Station, at Gainesville, contained the largest collection seen in Florida. Here in early April was found *Aurantiaca* in full bloom with beautiful apricot colored flowers, and *Emily Hume* was lovely with "pinched" petals and light yellow coloring.

(Continued on p. 82)

WILLIAM HERBERT MEDALISTS—1938

As announced in *Herbertia* 1937, it is the policy of the Society to award the William Herbert Medal to several outstanding horticulturists each year for a short period in order to take care of overdue honors. When this object has been accomplished, the Herbert Medal will again be awarded to only one person each year.

The awards for 1938—Ernst H. Krelage, Cecil Houdyshel, Major Albert Pam, Pierre S. du Pont, and Jan de Graaff—will surely appeal to all. Each one has made outstanding contributions toward the advancement of the amaryllids, and it is fitting and proper that honor be given where honor is due. In order to have a permanent record of the achievements of Herbert Medalists, biographical notices of the recipients are included in this volume. *Herbertia* 1938 is dedicated to Ernst H. Krelage and his autobiography is the main feature of this issue. Brief biographies of Cecil Houdyshel, Major Albert Pam, Pierre S. du Pont, and Jan de Graaff follow this brief introduction.

—*Hamilton P. Traub.*

CECIL HOUDYSHEL—EDUCATOR, PLANT BREEDER, AND
PROFESSIONAL PLANTSMAN

AN AUTOBIOGRAPHY

Let it be admitted at once that I have never before written an autobiography, and that this is purely the work of an amateur.

The most outstanding event of my life, that upon which all my future depended, occurred October 5, 1873, near Ottumwa, Iowa. The happy parents were Skillman and Priscilla Houdyshel. When I was four my parents emigrated to the Kansas prairies, but returned in two years to Iowa. There I attended a country school for three years until at about 11 we moved to Nebraska. Later we moved to Kansas, Missouri and back to Kansas. We lived all over Kansas.

Although I was not taught by Aristotle, my education was indeed peripatetic. My revered father used to say that he was born "in the sign of the feet" and liked to travel. At 19 I was graduated from the high school at Beloit, Kansas. Altho a slow, lazy pupil I loved to read. I had read much of Shakespeare, Dryden, other English poets, Humboldt's *Cosmos*, and scientific works on geology and biology. Therefore the high school scientific course was so easy that I was able also to finish the German and half of the Latin courses.

Then I alternated between teaching and going to college, and graduated from Campbell College at 22, with the degrees of B. S. and M. S. This was a small college, but inspiring. Later I graduated (at 29) from Kansas University and did nearly three years of graduate work there and at Berkeley, California.

It was a satisfaction to me that at about 21 my ambition for a thorough education, and perhaps physiological changes enabled me to

overcome my former indolence. It became very easy to study, learn and remember. I could always make at least 1½ years credit in one; or surprise the Professor by collecting and classifying 2000 plant specimens instead of the required 50.

At Campbell College and later at Kansas University I was a student instructor. For one term I did the work of an associate professor. At Kansas there was the opportunity to remain on the faculty but California, the land of perpetual flowers and of Luther Burbank, called louder.

We arrived in Pomona, California in 1905. I taught in several California high schools. My last six years were at Polytechnic High School, Los Angeles. Although I loved my profession, and still hold the years of teaching in delightful reminiscence, the breeding of bulbous plants, begun 40 years ago as a hobby, gradually claimed an ever increasing interest. Several times I had quit for a year or two to follow a commercial venture, but in each case, lack of financial resources forced a choice between teaching and its assured income, and the years of denial and hardship required for my family should I remain in a commercial profession. The popularity of my origination, the hybrid gladiolus *Los Angeles*, on the flower market, enabled me finally to quit teaching and to devote my entire time to the breeding and growing of bulbous plants.

This love for flowers may have been inherited. My mother and her father devoted much time to their culture. My grandfather Cowger was an early Iowa pioneer. He must have been a versatile man as he was the lawyer, doctor of medicine, school director, singing teacher, church deacon and later, Master of the Masonic Lodge in his settlement. By the time I arrived in Iowa he had a wonderful garden of flowers, a fine orchard and farm.

At the age of 12 I asked to be allowed to take care of Mother's flowers. I became an amaryllis enthusiast in my early 20's when I first owned an *Amaryllis Johnsonii*. It decided my future. I began growing seedlings of bulbous plants about that time. During the teaching years my boarding-house bedroom was "cluttered" with cans and boxes of them. In California, collecting bulbs of the Amaryllis Family and breeding them remained my hobby. From 1910 to 1912 I was Vice-Principal at Carson City, Nevada, and then Principal at Virginia City, the famous mining town. On trips back to my home, I usually visited Luther Burbank at Santa Rosa. I was drawn there by his gracious personality and wonderful collection of hybrid amaryllis and other plants.

Sometimes I remained a week, and spent entire days at his side. He treated me as a companion and friend. He was most distinguished in appearance and an eloquent and charming conversationalist. We discussed Religion, Politics, Art, Philosophy, Flowers, Breeding,—everything. He gave freely of his knowledge and experience, and encouraged my ambitions. He has so many successors that I am sure he did as much for any one who was interested.

Mr. Burbank advised me that growing and breeding amaryllis, which he did because he loved them, would not earn any profit. He advised me to breed hybrid gladiolus, and sold and gave me the foundation stock. He truly prophesied that it was the coming florists' flower.

I purchased many thousand amaryllis seeds and bulbs from Luther Burbank, the Aigberth Nurseries, Liverpool, England and a few from other sources. Mr. Burbank had developed a strain of "multipliers". The Aigberth amaryllis were the world's best in form and color. I crossed them and produced a strain I thought very good. Lack of popular appreciation restricted the care I was able to give them and most of the many thousands of bulbs are gone. Several varieties were introduced but these were of the pure Burbank strain. Only one remains in the trade,—*Sibly Houdyshel*. Altho almost white it has rugged vegetative functions and is a rapid multiplier. A dozen bulbs sold to a friend a little over 20 years ago have multiplied to 400 or 500. Credit for this origination was attributed to Luther Burbank when introduced, but later others gave me the credit. I only selected, increased and introduced it.

About 1914 I raised 600 seedling crinums from *longifolium-Moorei* crosses. The best one became *Cecil Houdyshel*. It is a fine deep pink and the most amazing bloomer I have ever seen. I have been very lucky in that feature which is also possessed by the hybrid gladiolus *Los Angeles*, and an unIntroduced hybrid iris of the *Plicata* type that blooms months on end. I once raised a seedling *Wisteria* that bloomed occasionally all summer.

Crinum hybrids are mostly sterile, which heretofore had stopped improvement with the first hybrid generation. But *Cecil Houdyshel* bears a few seed and a cross with *J. C. Harvey* was finally accomplished which gave rise to the first second-generation hybrid—*Virginia Lee*. It is unique among hybrid crinums in that it produces seeds freely. It apparently accepts the pollen from any crinum, even the scanty, slightly viable pollen of other hybrids.

Hybrid crinum *Gordon Wayne* is a chance seedling of *Virginia Lee*. It is pure white, larger; has broader foliage, and is a good seed producer, and multiplies by offsets faster than the parent variety. I have seedlings, from *Virginia Lee* and several of its descendants including *Gordon Wayne* crossed with the beautiful *Ellen Bosanquet*, that will bloom in a year or two. I have raised a great many crinum hybrids. Hundreds have been thrown away, and more of them sold in the trade as "assorted". A few are still under observation. I have a large, wider-petaled type of *Crinum asiaticum*, but it has made only 4 bulbs in over 20 years. The cuttage method is required to increase it.

Seedlings of *Callicore rosea* and some hybrids have been grown. A pretty, deep rose variety was introduced and then withdrawn as possibly not distinctive enough to warrant introduction. I am now growing thousands of seedlings of amaryllids. I hope to introduce a few more desirable varieties. I believe that the standard of quality should be so high that the market will not be overstocked with inferior varieties.

At 64 I am still looking forward to the future with confidence. My body, like that of any living thing subject to my care, is a bio-chemical laboratory and I watch the reactions from dietary and other habits. The main consideration is ability to work, to be happy, and to make others happy. To live and work until 100 is my ambition. My physician, a



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Cecil Houdyshel—Herbert Medalist, 1938



Elliott & Fry, Ltd., London

See page 76

Major Albert Pam—Herbert Medalist, 1938

Plate 101

wise, able and noted scientist, aged 80, says that it is possible. *Quien sabe?* At least I am still working, loving, living and happy withal. I may add,—so is my mother. But she is a smarter old lady than I can ever hope to be.

EDITORIAL NOTE.—Mr. Houdyshel is an idealist who has given his life to serving his fellow men, and he represents all that is noble and fine. It was fortunate that the amaryllid disease got him for it would have been a great loss to our gardens if he had not given us the highest ranking hybrid crinums—*Cecil Houdyshel* and *Virginia Lee*. There are only a very few crinum breeders in the whole world, and they deserve all honor for theirs is one of the most difficult fields of plant breeding. Mr. Houdyshel, however, is not one to leave a difficult task undone, and we can expect still greater contributions in this field from him in the future.

Mr. Houdyshel is a charter member of the American Amaryllis Society and has been a leader in the advancement of the amaryllids. His collection is one of the finest in the country, and he is constantly adding to it.

In awarding the William Herbert Medal to Mr. Houdyshel (Plate 100), the American Amaryllis Society honors one of the outstanding professional horticulturalists whose achievements are known to all. Those of us who have worked with him appreciate his ability, and his kindly, radiant personality that helps us over the difficult places.

Mira Flores,
Orlando, Florida,
April 15, 1938

—HAMILTON P. TRAUB.

MAJOR ALBERT PAM, O. B. E.

“Major Albert Pam, O. B. E., was born in London on June 26th, 1875, and was educated in England, Germany and Switzerland. He has been interested all his life in Zoology and Horticulture. He is Senior Member of the council, Zoological Society of London, silver Medallist 1914, Treasurer since 1932; F. R. H. S., Member of Iris, Alpine Garden and other horticultural Societies. He has established a large collection of amaryllids in his gardens at Wormley Bury, Broxbourne, Herts, consisting mainly of true species with very few hybrids. At present the collection under glass consists of many hundreds of plants belonging to 37 genera and representing over 140 different species.

“In addition to the above, a certain number of amaryllids are grown in the open, according to their hardiness, either at the foot of sunny walls or in more exposed positions. Among these hardy or semi-hardy amaryllids are several species of *Crinum* and *Habranthus*, *Hippeastrum Ackermanni*, *Beschorneria yuccoides*, *Lycoris*, *Leucojum*, etc., etc.

“The pride of the collection is a large group of *Pamianthe peruviana*, a new genus allied to *Ismene* introduced by Major Pam from Peru and named after him in the original description of the plant published

in the Botanical Magazine tab. 9315. This plant was figured in our 1936 Year Book. Another plant, *Leptochiton quitoensis*, was also first flowered and seeded in the Wormley Bury collection, and its true botanical position could thus be established. A new genus *Leptochiton* was formed to accommodate this plant for the seeds of this species differed from that of any other member of the family. A picture of this plant in flower was also reproduced in our 1936 Year Book, under its old name of *Hymenocallis quitoensis*.

“In addition the collection contains a number of new species introduced by Major Pam, many of which commemorate this in their specific names. Apart from the horticultural interest of these plants, Major Pam does not disregard the scientific side and is in constant touch with the Royal Botanic Gardens, Kew, and other Botanical Gardens to which he supplies plants or material in the form of flowers, leaves and fruit for the Herbarium. Botanists are thus often able to check their records concerning the plant in question and obtain fresh and complete material of every kind. Such cooperation between horticulturists and botanists is most useful to both, and should be encouraged in every way.

“Although he specialises in amaryllids, Major Pam is also interested in all other plants. He has a large collection of hardy flowering trees and shrubs. On his lake of 8 acres he grows a number of the best water lilies and in addition to these he has a large collection of ornamental waterfowl, pheasants and other birds.

“Major Pam is a frequent visitor to the United States, where he has been invited to see some of the most noteworthy gardens, with whose owners he has exchanged many interesting plants. He has also supplied the American Amaryllis Society at different times with bulbs and seeds of amaryllids from his own collection for the Society's experimental nursery.”

For many years Major Pam has served as unofficial ambassador of good will between England and America, a function which is appreciated in both countries. His interest in the amaryllids and other plants is that of the true scientist, and is entirely unselfish. In this capacity he has been of genuine service in determining phylogenetic relationships in the Amaryllidaceae, and he has also made available many new species to the plant breeder. It is therefore natural that Major Pam (Plate 101) should be among the first to receive the William Herbert Medal award. We hand him this medal with a feeling of admiration for service well done.

Mira Flores,
Orlando, Florida,
April 25, 1938

—HAMILTON P. TRAUB.

PIERRE S. DU PONT—OUTSTANDING MANUFACTURER,
PHILANTHROPIST, AND HORTICULTURIST

“Pierre Samuel du Pont, was born near Wilmington, Del., Jan. 15, 1870, son of Lammot and Mary (Belin) du Pont. His family was founded in America by the first Pierre Samuel du Pont, his great-great-grandfather, a French statesman and economist, who emigrated in 1799 and landed at Newport, R. I., with the younger of his two sons, Eleuthere Irenne du Pont who founded the du Pont de Nemours Powder Co. at Wilmington, Del., in 1802. Pierre was educated at the William Penn Charter School in Philadelphia and at the Massachusetts Institute of Technology, where he was graduated with the degree of Bachelor of Science in 1890. Mr. du Pont was married, October 6, 1915, to Alice, daughter of Henry Belin of Scranton, Pennsylvania.”

CAREER AS MANUFACTURER

“Mr. du Pont’s first experience of powder manufacturing was acquired in the du Pont de Nemours powder plant in Wilmington, which he entered after graduation. In 1892 he became assistant superintendent of the company’s factory at Carney’s Point, N. J., where smokeless powder and gun-cotton were produced and where, with Francis G. du Pont, he developed the “du Pont Smokeless”, a sporting powder for which patents were granted to them jointly.

“In 1899 Mr. du Pont became president of the Johnson Co. of Johnstown, Pa., and Lorain, O., a steel manufacturing concern which was in liquidation after disposing of its business. He spent three years in developing for advantageous sale this company’s other interests, which consisted of street railway properties and large realty holdings in Lorain. He returned to the du Pont de Nemours Co. in 1902 as treasurer upon its reorganization as a great consolidation by the absorption into one company of about a hundred different corporations which had been operating the explosive manufactories of the company as separate units.

In 1915-19 Mr. du Pont was president of the company and since the former year has been chairman of the board of directors. Most of the company’s enormous munitions production for various governments in the World War period was undertaken during Mr. du Pont’s presidency. The war’s requirements caused enormous additions to be made to the company’s plants. At Hopewell, Va., on the James river, the company established on a corn field a group of factories for producing gun cotton, transforming the site into a city of 45,000 inhabitants in a few months. It was daily producing 1,500,000 pounds of gun cotton for smokeless powder when the armistice came and stopped the work. The company also constructed for the government the Old Hickory smokeless powder plant on the Cumberland river, near Nashville, Tenn., many times larger in area and capacity than the largest powder works hitherto built anywhere. For building the plant which cost \$85,000,000, the company received the sum of one dollar from the government. As in the case of

Hopewell, the war's close, just as the plants were reaching their full capacity, caused the entire property to be abandoned. During the entire war period the du Pont plants supplied the allies and the United States with more than fourteen million pounds of military explosives. The company sold its products to the government at prices that were ten to sixteen per cent lower than pre-war prices for munitions, in spite of a great advance in the cost of raw materials. It invested \$121,700,000 in Liberty bonds and other government securities and \$111,000,000 in the securities of allied countries, besides contributing more than \$2,000,000 to the welfare war work of the American Red Cross and the Y. M. C. A.

“Since the war the great resources of the du Ponts have been applied in a variety of fields outside powder production. In 1920 the company entered the automobile field by acquiring a large interest in the General Motors Corporation, of which Pierre S. du Pont was president and chairman of its executive committee until 1923, when he became chairman of the board of directors. He resigned as Chairman February 7th, 1929. The company has auxiliary companies that produce “Pyralin”, paints, varnishes and colors, substitutes for leather, ivory and shell in the manufacture of many useful articles. It is part owner in the du Pont-Pathe Film Manufacturing Corporation. Other allied activities of the company include the du Pont-National Ammonia Co., General Explosives Co., du Pont Engineering Co., du Pont Rayon (fiber silk) Co., and du Pont Cellophane Co. Besides being chairman of the board of the E. I. du Pont de Nemours & Co., Mr. du Pont is a director of the American International Corp., Bankers Trust Co. of New York City, Philadelphia National Bank and of the Wilmington Trust Co., (also vice-president).”

PHILANTHROPY AND PUBLIC SERVICE

“Mr. du Pont is a member of the corporation of the Massachusetts Institute of Technology and of the American Philosophical Society. He has taken a great interest in education in Delaware as a member of the state board of education and as state school tax commissioner. Has expended approximately \$6,000,000 remodeling and modernizing part of the state's public schools outside Wilmington. He also gave \$1,000,000 for developing the University of Delaware at Newark, Del., and in 1927 made a further donation of \$400,000 towards bettering educational facilities in the State. In 1925 he was appointed state collector of income taxes in Delaware. Mr. du Pont holds the honorary degrees of LL.D. of Lafayette College and the University of Delaware, both conferred in 1922, and was made an officer of the French Legion of Honor in 1928. He has been a Republican in politics, but as an anti-prohibitionist in the presidential campaign of 1928 supported Gov. Alfred E. Smith, the Democratic candidate, and subscribed \$50,000 to the party's campaign fund.”



Wm. Shewell Ellis, Wilmington, Delaware

See page 81

Pierre S. du Pont—Herbert Medalist, 1938



Columbia Studio, Portland, Oregon

See page 82

Jan de Graaff—Herbert Medalist, 1938

HORTICULTURAL ACTIVITIES

Mr. du Pont's favorite pursuit is horticulture, especially the cultivation of rare exotic plants, which he grows at his spacious estate outside Wilmington. The amaryllids have been a large part of his plant collection for many years, and this was fortunate for the future of the hybrid amaryllis. During the first three decades of the present Century, when interest in this group, for various reasons, declined, he cherished the finest hybrids and thus tided them over a period when most stocks were lost forever.

With this fine foundation stock as a basis, systematic breeding operations were undertaken and as a direct result his amaryllis collection is today one of the World's finest. The breeding method almost universally followed by others consisted of crossing varieties of similar color values, and this gave races of very "obvious" reds as a rule. Mr. du Pont was apparently the first to demonstrate the breeding method which gives subtle, delicate, orchidaceous shades of color in hybrid amaryllis. He accomplished this by crossing white, or light colored varieties on the darker ones. The results are so outstanding that all of the amaryllis breeders who have seen these hybrids, are now using the same breeding method, and in this way the influence of his work has had a profound effect on the improvement of the World's amaryllis stocks. The large numbers of light pink varieties shown at the amaryllis shows of the past season, bear out this statement.

Mr. du Pont is a charter member of the American Amaryllis Society, and is Chairman of the Trial Collections Committee for the Southeast. He is keenly interested in the advancement of the amaryllids as a whole. The presentation of the William Herbert Medal to Pierre S. du Pont (Plate 102) is a fitting tribute to his sterling character, his devotion to the highest ideals in business, in public service, in education and science, as well as his service in preserving and improving plant germ plasm, particularly that of Hybrid amaryllis.

*Mira Flores,
Orlando, Florida,
May 10, 1938.*

—HAMILTON P. TRAUB.

JAN DE GRAAFF, A BIOGRAPHICAL SKETCH

Jan de Graaff was born in Leiden, Holland, in 1903, and is the son of Willem Hendrick de Graaff, and a grandson of Simon Adrian de Graaff, who were both renowned Dutch narcissus growers. The name of de Graaff has been associated with the bulb business in Holland for more than a century, and Jan de Graaff is the only member of the present generation of the Family who is following in that tradition.

He was educated in Holland and England, and his education was supplemented by an apprenticeship in England with J. R. Pearson & Son, Lowham, near Nottingham. In 1921 he entered the firm of de Graaff Bros., of Noordwyk, Holland, and devoted himself to the hybridizing of narcissi. In the same year he made his first trip to the United States.

During the following decade he visited the United States annually until he took up permanent residence in Oregon in 1931. He became a director of the Oregon Bulb Farms, Sandy, Oregon (Wholesale Narcissus Growers), and subsequently he became sole proprietor of that firm.

His work with amaryllis has been confined principally to the Genus *Narcissus*, and his collection of hybrid varieties and species is unusually complete. The portrait, (Plate 103), shows him at work in the large fields of narcissi at Sandy, Oregon, where his breeding experiments are carried on. Many of the seedlings introduced by Jan de Graaff have become favorites with the American public, and among his latest introductions, displayed recently at the spring flower shows by leading retailers, there are several of special merit.

As a member of the board of directors of the Northwest Bulb Growers' Association, he has worked unceasingly for the popularization of narcissi in the United States, not only as a lecturer and writer but also by means of exhibits featuring narcissi which are sent to the various shows throughout the country. With his sterling character and pleasing personality, the success of his efforts are a foregone conclusion.

The award of the William Herbert Medal to Jan de Graaff, in 1938, comes as a partial reward at least for consistent work and outstanding achievement in his chosen profession. The American Amaryllis Society is honored to have him as a distinguished member, and America is proud to claim him as an adopted son.

Mira Flores,
Orlando, Florida,
May 1, 1938

—HAMILTON P. TRAUB.

IMPRESSIONS OF FLORIDA DAYLILIES—WINTER 1937-38

(Continued from p. 69)

A noticeable change was noted in *Waw-Bun* as there was practically no trace of the fine fulvous coloring which makes it so attractive in the North.

Outstanding were the plants of *Brownie* which had the appearance of miniature multiflora hybrids. It was only about fifteen to eighteen inches tall, and the branching scapes produced quantities of small two and a half inch flowers of a dark brownish-red color with an eyezone of madder brown. The sepals were only a shade lighter giving the entire flower a very decidedly brownish cast.

Brownie was in existence before the *H. multiflora* was introduced in America. It is a seedling developed at the New York Botanical Garden, and one of the first obtained by hybridizing a fulvous daylily.

When raised in the North *Brownie* grows about three feet tall but the blossoms remain the same size and this makes an unbalanced plant.

Florida is a veritable Wonderland for daylilies and *Brownie* reminds you of "Alice" for Dame Nature has said "grow small, grow small, you are too tall," and a perfect plant results. If planted with the late George Yelds' hybrid *Winsome*, whose pale yellow sweet-scented blossoms grow to about the same height, you will have two perfect little border or rockery plants for Florida.

(Continued on p. 93)

1. REGIONAL ACTIVITIES AND EXHIBITIONS

THE 4TH. NATIONAL AMARYLLIS SHOW, POMONA, LOS ANGELES COUNTY, CALIFORNIA

CECIL HOUDYSHEL, *California*

The California freeze of January 1937 caused the postponement of the Fourth Annual Amaryllis Show scheduled for spring at Montbello, California. It was rather late for much publicity or preparation but plans were made to hold the show in the fall in conjunction with the annual flower show of the Los Angeles County Fair, at Pomona, California. The Fair grounds are located only about two miles from the nursery and home of the writer.

We would like to present briefly the setting in which the show was held. The Los Angeles County Fair is an annual event. The buildings are extensive and permanent as this is probably the greatest county fair in America, greater than most state fairs. This county's agricultural and horticultural products according to government statistics, rank highest in value in the country. The Fair's attendance in 1937 was 635,383. Probably a major portion of them visited the Flower Show and hence saw the Amaryllis Show.

The Flower Show was staged in the center of the Agricultural and Horticultural Hall. This is a concrete and steel structure 800 feet long and 135 feet wide with a curved roof. There is not a post nor support between the outside walls.

The building is equipped with the very best indirect lighting system, and a system of public address which was of use for the medal ceremony.

Along the side walls were arranged the orange and lemon exhibits of the various Association units. In the middle were the exhibits from other counties, various community and commercial exhibits. In the photograph of the Medal Presentation (Plate 99), the La Verne exhibit can be seen in the background.

At the center of the building the floral exhibits were staged around a pool of water lilies. One low platform was occupied by the Amaryllis Show.

In spite of the short time for preparation and the lack of publicity, a very creditable showing was made, largely through the hearty cooperation of Richard Diener of Oxnard and Las Positas Nursery of Santa Barbara. The flowers were judged by Mr. A. Pieters of Germain Seed Co., Los Angeles and Mrs. Leonard Swetts of Riverside, California both members of the Amaryllis Society. The exhibits were staged on September 23 and most of them remained in place and in good condition for nearly a week.

The display of Richard Diener would have been an outstanding one in any flower show in the world. Probably no other grower north of the tropics could exhibit flowers of *Hippeastrum* hybrids in large quantity in September. There were 50 or more stems of cut flowers. Ordinarily we would call them "out of season" but the term does not seem to apply to his strain. His flowers are noted too for their immense size.

We have measured one that was 10 inches across the face in the natural position of the petals. A First Prize was awarded for the display.

The credit for displaying the rarest amaryllids belonged to Las Positas Nursery of Santa Barbara. Among their exhibits were rare species and hybrids of nerines, *Milla biflora*, *Bessera elegans*, *Amaryllis belladonna* (Ait.) and *Brunsviga*. Especially interesting was an *Amaryllis belladonna* (Ait.)--*Brunsviga* hybrid, *Brunsdonna baptisti alba*. Several blue ribbons were awarded to their exhibits.

Las Positas Nursery located on the famous Hope Ranch at Santa Barbara, among beautiful groves and bountiful orchards deserves commendation for a progressive spirit in building up stocks of many bulbs including many amaryllids that are rarely offered in the American trade. They do a wholesale business only.

The Special American Amaryllis Society Certificate for exhibiting the largest number of species was awarded to Cecil Houdyshel of La Verne. Nearly twenty species were shown. Several blue ribbons were awarded to individual species shown by him.

Not all fall-blooming amaryllids can be had for exhibition at one time. Unfortunately some of our best, such as *Lycoris aurea*, *L. incarnata* and *L. squamigera* were not flowering. Few nerines were blooming. *Vallotas* were just gone. Many bulbs were injured or made erratic in behavior by the January freeze. This may account for the fact that several noted growers did not exhibit.

A few amateurs said they could have brought a flower or two but thought it not worth while to exhibit so few.

It is hoped that next year's show will represent the combined efforts of every commercial grower within the limits of distance. Amateur growers are especially invited to show even a few specimens, either rare or common.

For a Premium List write to Ernest Middleton, Los Angeles County Fair, Pomona, California.

THE 5TH. NATIONAL AMARYLLIS SHOW, PASADENA, CALIFORNIA APRIL 3 AND 4, 1938

CECIL HOUDYSHEL, *California*

The 5th. National Amaryllis Show was held in conjunction with the Pasadena Flower Show, and this event took place in the large Civic Auditorium where many commercial growers exhibited their flowers in ideal landscape arrangements. The amaryllid exhibits were not segregated from the others, but were mingled with other plants. The writer and Mrs. Houdyshel attended not with the intention of writing a description of the show, and the following notes are therefore somewhat sketchy.

The Pasadena Flower Show is held annually in the large Civic Auditorium. Many commercial growers exhibit their flowers in ideal landscape arrangements.

Just at this time *Clivias* are at their best. But only a few were shown. The best were probably those of Mr. Zimmerman who exhibited

only cut stems. Our own had been recently moved, bare rooted, into our new Clivia house and were not in condition.

A species formerly classed with the amaryllids attracted our attention, *Anigozanthos manglesii*. Its oddity is more noteworthy than its beauty as it reverses the usual habit by displaying small green flowers on a gaudy red scape.

Howard and Smith showed *Hippeastrum* hybrids of the highest quality. Fred Howard has produced for this firm the outstanding American strain. He has bred them for at least 20 years. The fine form and rich color variations compare favorably with the best European strains.

An equally noteworthy exhibit of hybrid *Hippeastrums* was that of Richard Diener. His flowers are probably the largest in existence. We measured one flower that was 10 inches in diameter. The colors are various, often vittate, the form, that of *equestre*. His strain has the added distinction of producing a good crop of flowers in the fall with many in between.

We were especially pleased to see so many daffodils, old and new. The best Barri daffodil was *Effie*, which has a yellow perianth. *Firetail*, a white perianth Barri, with brilliant cup, was striking. *Whitley Gem* and *Fortune*, both yellow perianth *Incomparabilis* were exquisite.

White Trumpets were represented by *Alice Knight*, *Beersheba*, *President Carnot* and *White Conqueror*, all fine. Of the yellow Trumpets, *Aerolite*, *Warwick* and *Hector Treub*, we considered the last named as best.

Her Grace, an extra fine large crowned Leedsii, was shown, and also *Silver Star*.

We noted with interest the *Triandrus* hybrid *Pearly Queen*, with white perianth and light lemon trumpet, and *Glorius*, a very well named Poetaz.

SOME NOTES ON THE SOUTHEASTERN REGIONAL AMARYLLIS SHOW AT ORLANDO, FLORIDA, MARCH 23-24, 1938

RUSSELL S. WOLFE, *South Carolina*

The 1938 Show was the first exhibition of the American Amaryllis Society that we¹ attended since the 1935 Spring Show at Orlando. We had a few blossoms and decided to make a quick trip to enter them in the Show. As none of our amaryllis had ever been entered in any of the shows, we were anxious to find out how they would stand up under severe competition. The officials of the Society, and those in charge of the Show were exceptionally nice to our flowers and to us. The show was neatly and tastefully staged.

The outstanding thing about the event was the marked improvement in the quality of flowers as contrasted with former exhibitions. In the lighter colors, especially, the average has improved considerably.

¹Mr. Wolfe was accompanied by his charming wife.—Ed.

The tendency seems to be more and more towards improving quality and increasing the color range and not to grow any sort of amaryllis to obtain a quantity of bulbs with "obvious" colors.

The knowledge of better cultural methods and the ability to apply them was well shown by the better appearance of the entire plants. The flowers shown were as good as those seen in the shows in Holland and England in the spring of 1935, and those seen at the International Flower Show, New York City, in the spring of 1937.

The display of Doctors Traub and Hughes was not entered in competition for Dr. Traub was chairman of the committee of judges. It was especially educational and interesting, clearly demonstrating the improvements mentioned above. It was in three sections—almost whites, light pinks, and medium reds. The light pink section consisted of 28 potted plants mostly flowering in eighteen months from time of planting seeds.

As evidence that the method of vegetative propagation is a practical success, there was a notable increase in named varieties. The variety singled out as the "best bloom" in the Show, was named *Helen Heaton* for the wife of Mr. I. W. Heaton. This was a deserved honor for I am told that Mrs. Heaton is a very great help to Mr. Heaton in his bulb business. Mr. Heaton's exhibit was the largest in the Show, and took away most of the honors.

Another variety that received much favorable comment was in the display of Doctors Traub and Hughes. It was named *Katherine Auchter* for the wife of the Chief of the U. S. Bureau of Plant Industry, Washington, D. C. It is a beautiful shade of pink with an orchid sheen in the throat. The only white amaryllis in the show was entered by Mr. Wyndham Hayward, of Lakemont Gardens, Winter Park.

There was a steady stream of visitors during the entire time of the show, and the great interest shown by them was very noticeable. Of the visitors to this show, the men seemed to greatly outnumber the women, more so than at any other flower show of any kind that I have ever visited. The men showed more interest in the individual flowers, and were more inquisitive as to details.

This show proved to be very successful, and was of much interest and value to us, and really, a pleasure well worth the trip and more.

THE 5TH. SOUTHEASTERN REGIONAL AMARYLLIS SHOW, ORLANDO, FLORIDA, MARCH 23 AND 24, 1938

The 5th. Southeastern Regional Amaryllis Show held at Orlando, Florida, March 23 and 24, was outstanding for the most varied amaryllid exhibits brought together up to the present, the improvement in quality of amaryllis flowers, and the greater number of exhibitors who cooperated. The show was managed by Mr. R. W. Wheeler, Chairman of the Exhibitions Committee for the Southeast, and he was ably assisted by Dr. and Mrs. A. E. Hughes, Mr. and Mrs. I. W. Heaton, Mrs. Paul Harding, and Mrs. E. L. Lord.

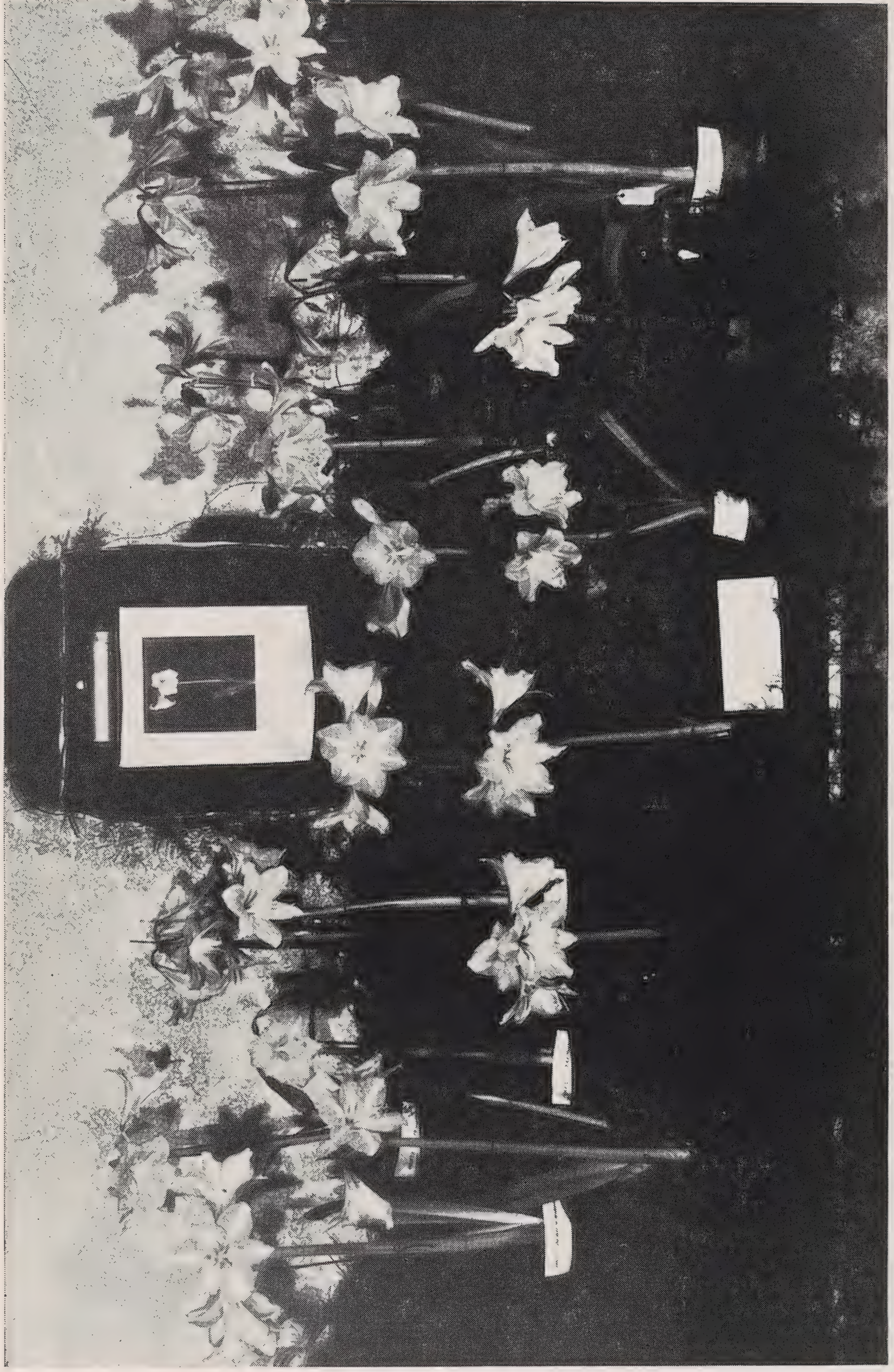
The following exhibitors were represented at the show:—I. W. Heaton, Orlando; Wyndham Hayward, Winter Park; J. J. McCann,



American Amaryllis Society

See pages 89 and 91

Some of Russell S. Wolfe's hybrid Amaryllis at the Southeastern Amaryllis Show, Orlando, Fla., 1938
Plate 104



American Amaryllis Society

See page 89

Partial view of Traub & Hughes Exhibit (light pink amaryllis) at the
Southeastern Amaryllis Show, Orlando, Fla., 1938

Punta Gorda; E. A. Peterson, Orlando; John R. Heist, St. Augustine; E. L. Lord, Orlando; Mrs. Della Harper, Orlando; Frank Vasku, Winter Park; M. C. Varnier, Fort Pierce; H. P. Traub, Orlando; A. H. Smith, Orlando; Mrs. R. E. Kline, Windermere; Mr. J. R. Ballentine; Orlando; Russell S. Wolfe, Orangeburg, South Carolina; and the joint exhibits of H. P. Traub and A. E. Hughes, Orlando (see Plate 105).

The exhibits included *Amaryllis* species, very fine and varied hybrid *Amaryllis*, *narcissi*, *Cyranthus*, *Cooperia*, *Crinum* species and hybrids, and exceedingly fine *Hemerocallis* (Daylilies).

Among hybrid *Amaryllis* the following named varieties received awards:—*Salmon Queen* (Heaton) FFC; *Pres. Roosevelt* (Heaton), 1st. prize; *Mrs. Lamberton*, (Heaton), 1st. prize; *Cardinal* (Heaton), FFC; *Orchid* (Heaton), FFC; *Theodore Mead* (Heaton), 1st. prize; *Berengaria* (Heaton), 1st. prize; *Red Wing* (Heaton), 1st. prize. Many awards were made to unnamed varieties including exhibits by Frank Vasku, E. A. Peterson, Wyndham Hayward, Mrs. R. E. Kline, J. R. Ballentine, M. V. Varnier, Russell S. Wolfe (See Plate 104), and J. J. McCann.

First prizes were awarded for *Cooperia Drummondii* (to Hayward); *Amaryllis Johnsonii* (to Vasku); *Amaryllis rutilum crocatum* (to Hayward); *Crinum Powellii album* (to Hayward); *Crinum Krelagei* (to Hayward); *Crinum Cecil Houdyshel* (to Hayward). *Crinum Louis Bosanquet* (to Heist) was awarded both a first prize and a First Class Certificate. *Cyrtanthus McKenii* and *Crinum pedunculatum* were exhibited by Traub, but not in competition.

Seedling daylilies, not named, were exhibited by E. L. Lord and Wyndham Hayward. Prof. Lord received the first prize for the best collection of daylilies. Other varieties exhibited by Prof. Lord and which received first prizes were:—*Oriole*, *Canary Bird*, *Harvest Moon*, *Semperflorens*, *Aureole*, *Florham*. *Parthenope* exhibited by him received a First Class Certificate. Mr. Hayward exhibited *Waubun*, *Mikado* and *Chrome Orange*. The first two received first class certificates, and the third, a first prize.

The variety, *Helen Heaton* (Heaton), was singled out as the best hybrid *amaryllis* flower in the show, and it also received a first class certificate.

Mr. Heaton received the award for the best hybrid *Amaryllis* bloom in the show (*Helen Heaton*), and first prize for the best exhibit (Plate 106). He also received the most points, and was awarded the Grand Prize.

One of the outstanding exhibits at the show was a photoprint of a hybrid *amaryllis* in color by Mr. Edward Steichen. This is shown in the center top of Plate 105. It was the subject of many favorable comments, and Mr. Steichen is to be congratulated on the success he has achieved.

Mr. Russell S. Wolfe's exhibit of a fine group of large-flowered nearly white hybrid *amaryllis* (Plate 104) illustrates the feasibility of transporting *amaryllis* while in flower for considerable distances since

they were brought down from Orangeburg, South Carolina in an automobile.

On the whole the show was successful in every way, and every one connected with it had the feeling that the time and effort expended yielded ample dividends.

Committee of Judges

HAMILTON P. TRAUB

MRS. W. L. TILDEN

A. T. COITH

March 24, 1938

THE 1938 AMARYLLIS SHOW OF THE BUREAU OF PLANT
INDUSTRY U. S. DEPARTMENT OF AGRICULTURE

The twenty-fifth annual Amaryllis Show of the U. S. Department of Agriculture was held at the Department Greenhouses, Fourteenth Street and Constitution Avenue, N. W., Washington, D. C., from March 26 to April 3, 1938, inclusive. It was open each day from 9:00 a. m. to 9:00 p. m. and was viewed by 37,391 people.

The exhibition comprised 1,260 amaryllis bulbs, each bearing two or three flower stems with two to seven flowers on each stem. Thus there were displayed several thousand flowers ranging in color from dark velvety red through various shades of red, pink, orange, yellow-orange and striped types to pure white. The plants were arranged in the exhibition house on two side benches and on a center elongated pyramidal staging. Small pots of *Vinca major* with rounded grey-green leaves edged with white were placed between the pots of amaryllis to form a pleasing combination with the pointed dark green leaves, thick silvery green flower stems and clear bright blossoms of the amaryllis. Baskets of Trailing Fuchsias were hung from the roof of the greenhouse. Several large pots, each containing a group of bulbs in flower, were placed along the ridge of the center staging to provide accent notes.

The bulbs in the Department's collection of amaryllis are hybrids resulting from many years of breeding work carried on by Department of Agriculture experimenters since 1909 when twelve varieties were imported from England. The Amaryllis Shows are exhibitions of the results achieved by the Department in one of the many phases of its work to produce improved plant forms. Department workers with amaryllis have successfully endeavored to obtain longer stems, new shades and larger flowers. The white amaryllis was produced through successive selection and cross-pollination of striped flowers showing the most white. A group of seedlings, flowering for the first time this spring, revealed new subtleties of color, particularly in the lighter shades.

IMPRESSIONS OF THE SOUTHEASTERN REGIONAL AMARYLLIS
SHOW, ORLANDO, FLORIDA, MARCH 23 and 24, 1938

MRS. E. L. LORD, *Florida*

The 1938 Southeastern Regional Amaryllis Exhibition was held at Orlando, Florida, March 23rd. and 24th., in the Chamber of Commerce Building. Staging, draped in Spanish moss and Asparagus fern, had been erected down the long arcades on each side of the lobby and here the main competitive classes made a spectacular array of white, pink, and red—the orange shades were strangely lacking. Around the fountain in the center were baskets and jars of the Decorative classes showing the use of amaryllis in home decoration. Here, also were the Crinums, which appear to be enjoying a revival of interest among Florida gardeners, and quite a number of rarer exotics that were worth showing altho not amaryllids. Across each end were the stands for the collections and the double classes, which included both species and a group of the new hybrids. Facing the fountain were the other amaryllids, *Zephyranthes*, *Cooperia*, *Narcissus*, *Crinum*, *Hemerocallis*, etc.

A highly educational feature was a group of seedlings staged by Drs. Traub and Hughes, which showed the results of a special breeding experiment with the object of producing true pink varieties. The pink varieties exhibited consisted of twenty-eight potted plants, including the named varieties, *Katherine Auchter*, *Kay Harding*, *Reba Cooper*, *Duchess of Windsor*, *Princess Elizabeth*, *Mrs. T. R. Robinson*; *Etta McNeel*; and *Sara Cole*. Among the reds, the named varieties, *Mrs. R. W. Wheeler*, and *Fire*, were outstanding. If these blooms had been in competition the judging awards would undoubtedly have been very different.

The high light of the whole Exhibition for me was a new white amaryllis seedling shown by Russell S. Wolfe of Orangeburg, South Carolina. It was as near a perfect white as I have ever seen. Of perfect form, not stiff, but delicately ruffled and reflexed, with just enough of a greenish tint to give life and sparkle to the whiteness. It would make a splendid garden picture and would be unsurpassed for indoor decoration. One exhibit was a single specimen with 6 or 7 blooms at the same stage of maturity, making a plinth of sparkling purity. The other, 6 plants, uniformly and perfectly grown, in an ornamental box, looked like a sculptured group in alabaster and jade.

Altho the exhibitors were almost entirely local growers, a very creditable showing was made over a wide range of classes and the Show Manager, Mr. R. W. Wheeler, and his Committee, are to be congratulated on a very successful performance. Success in any exhibition can be judged by the interest manifested. Both local people and winter visitors circled the room in a constant stream and certainly three-fourths of them asked me questions, ranging from "What are Amaryllis?" to "Can I grow these bulbs in Maine-or Wisconsin-or Idaho?" One of the crying needs of our flower shows seems to be an Information Committee with badges.

NEW YORK SPRING FLOWER SHOW, 1938

T. A. WESTON, *New York*

The competition at this famous International Flower Show, March 14-19, was not quite so strong in Amaryllis on this occasion as in 1937, and as in former years, the exhibitors were mostly private individuals.

The group for 50 sq. feet attracted four entries, the leading one shown by Mrs. W. Jennings, Cold Spring Harbor, Long Island, Gardener John Lee; this showed some good examples, although to our own way of thinking the two runners-up had finer types and in one instance even larger flowers.

Mrs. Jennings also won first with six plants in that class, against two other entries, while in the 12 plant class, Mr. S. A. Savage, Glen Head, Long Island, Gardener T. Chadburn had no opposition. His plants were superb.

The competition in the Narcissus classes, private, is always very keen in New York, and to my knowledge nowhere else are such fine forced examples staged. The varieties include the best of the reasonably priced Trumpet, Incomparabilis, and Barri types. The schedule usually calls for six 8-inch pots or pans. The growers literally crowd the bulbs on top of each other and all the entries are invariably notable for high cultural skill.

On this occasion, Mr. S. A. Savage won first with Trumpet types, also with Incomparabilis, and any other types, distinct varieties; but with Poetaz types, Mr. Savage was second to Mrs. D. Suarez, Syosset, L. I.

With a 50-foot display of cut blooms, Mr. J. Pierpont Morgan, Glen Cove, L. I., Gardener J. Kelly, literally swamped two other rivals. Mr. Kelly, without doubt one of the most skillful gardeners in the country, is a past master at forcing Daffodils and his collection of 18 sorts, 6 to 10 of each, included *Beersheba* and even newer varieties, all of them of such superb quality that experts considered the blooms equal to the finest ever grown under natural conditions later in the season.

Clivias are not largely grown by the general run of private gardeners in the East. They require considerable room, and of course must be kept under glass during the winter. However, there are always a few entries competitively, and on this occasion, Mr. S. E. Mitchell, Oyster Bay, L. I., gardener A. Reoch, led with one fine specimen, a particularly grand plant while with six plants, Miss L. Constable, Mamaroneck, N. Y., gardener J. Stuart, was first with some splendid hybrids. The latter probably has the largest collection of Clivias in the New York section and on several occasions has shown a large group in conjunction with Acacias which are also largely grown.

The tall yellow acacias with the various shades of the Clivias make a most wonderful combination.

INTERNATIONAL S. A. F. FLOWER SHOW, TORONTO, 1938

T. A. WESTON, *New York*

This exhibition, held under the auspices of the Society of American Florists, during the presidency of Mr. Arno Nehrling, son of the late Henry Nehrling of Florida, pioneer amaryllis breeder, took place March 24 to April 2, and was notable for one particularly outstanding group of fine hybrid amaryllis staged in bed fashion. This display was at the base of the large central fountain, and covered 100 sq. feet, containing some 50 plants in full bloom which were a credit to the exhibitor, Mr. Fred Adams, of Adams Florist, Toronto.

These were presumably imported Holland type bulbs, most of the flowers were of the so-called Leopoldi type, with widely expanded and rounded petals. Pure whites were absent, but the group showed a fine range of pink and red shades, some being a decided salmon shade, while rich crimsons were likewise noted among the reds. Numbers of the blooms were eight inches or more across and most of the stems carried four flowers.

IMPRESSIONS OF FLORIDA DAYLILIES—WINTER 1937-38

(Continued from p. 82)

Reviewing the situation in peninsular Florida as a whole we find daylilies may be grown to advantage from Homestead to Gainesville and surrounding sections. It appears that hybrids tend to change their normal characteristics, most of them becoming lower in growth, and that fulvous colorings in the blossoms become less pronounced and lighter.

The evergreen daylilies are preferable because of the luxuriant green ground cover they produce throughout the year. Here also four distinct flowering periods give prolonged garden beauty and three times more opportunity for hybridizing than in the sections where only a single flowering period exists. Seedling hybrids will begin to blossom at the end of the first year if given special attention.

It would seem therefore that Floridians must select their own daylilies according to the characteristics they display under the climate conditions. Evergreen varieties should undoubtedly be given the preference and probably many hybrids and hybrid seedlings which seem unsuited to Northern conditions might become of the utmost value to Florida.

April 1938

HEMEROCALLIS BROWNIE

What is that cute little daylily
There on the paths' further side
Holding on scapes growing sturdily
Blossoms which must be your pride.

Where did it get such a coloring
Red as deep kissed by the sun
Eyes that are brown like mahogany
Surely must please everyone.

Brownie you call it in Florida
Growing 'neath hot sunny skies.
Here it must stay where 'tis summery
Never to change in its size.

Sorry are we, living Northerly
Brownie grows up to be tall,
Losing the grace which is charmingly
Seen when it stays very small.

True that we cannot have everything,
Nature has played us a jest
Making us visit in Florida
Brownie to see at his best.

—ETHEL P. DEWEY

THE DAYLILY DISPLAY GARDEN AT THE FLORIDA
AGRICULTURAL EXPERIMENT STATIONJOHN V. WATKINS, *Assistant Horticulturist*

From a very humble beginning in the late nineteen twenties when four plants of Daylilies comprised the *Hemerocallis* section at the University of Florida, the planting has grown until today there are one hundred named clones, nine species and several hundred seedlings that have been bred and selected for one character or another.

This public Display garden is situated to the west of the lath house of the Department of Horticulture, and is on soil of the type known as Norfolk fine sand. This soil has proven itself to be ideally suited to Daylily culture when it receives plant food and water in reasonable abundance. It has been the custom to apply a heavy mulch of cow manure each February and to supplement this twice thruout the growing season with applications of a balanced commercial fertilizer.

The photograph, Plate 115, shows the garden to be composed of four large rectangular beds encompassed by walks of Centipede grass. Within these beds plants are arranged in equilateral triangles of three of a kind with a permanent cypress and metal label supplying an easily read marker for each name. It seems to be the consensus of opinion among visitors to the garden that three clumps of one kind in a group will give each variety an excellent chance to show to the best advantage. Careful notes are taken every four days during the flowering season so that the beginning, peak, and end of bloom will be recorded for each variety each season. Records that cover five consecutive seasons of flowering are now on file and the present plans call for a continuation of this record taking. It is hoped that facts assembled in this work may be published in a Bulletin on Daylilies during 1940. These data display many interesting details. One of the most striking facts is that a given clone may vary as much as a month in its climax of flowering. Another interesting fact is that many varieties have a second definite blossoming season in late August or early September. In this connection the idea of an autumn flowering race developed especially for Florida conditions is a most attractive one. From observations on the behavior of many clones in North Florida, the writer is of the opinion that this race will be a reality in a few years. It may have a strong infusion of the blood of *Hemerocallis multiflora* and it may also have in its ancestry such excellent late clones as *Semperflorens*, *Domestico* and *Cressida*. As the new multiflora hybrids from the New York Botanical Garden reach the gardens of peninsular Florida, it is hoped that Daylily enthusiasts will find the season extending well into the autumn.

In regard to the other end of the season, the variety *Domestico*, (not one of the little grassy *Dihemeris*, but a big, upstanding, ever-green Daylily), will open its clear orange flowers so early in March that they are frozen in Gainesville almost every year. This clone was introduced into Florida from Mississippi by Mr. R. N. Lobdell of the Everglades Experiment Station Staff, and its habit of blossoming very early in the springtime and again very late in the autumn makes it a most welcome addition to any collection of Daylilies.

The public display garden at Gainesville has been developed entirely in the interests of Florida gardening and it is hoped that persons who admire Daylilies as good garden plants will avail themselves of the facilities of the garden, particularly during the height of the blooming season. Mimeographed check lists are handed to all visitors so that each person may take notes on the varieties that are particularly attractive to him. These lists should be of value when an order is to be made from a nursery catalog which might be guilty of painting a too-rosy picture of its offerings. No attempt will be made here to evaluate the varieties of Daylilies as to their relative merit as garden plants.

It is contrary to the policy of the Florida Agricultural Experiment Station to distribute plants of any kind in competition with the nurseries and so it is not possible for gardeners to acquire Daylilies here, but the staff of the Department of Horticulture is anxious to do all that it can to help visitors enjoy the garden and take notes on the outstanding plants.

It would have been impossible to build this garden to its present size had it not been for the kindness of Dr. A. B. Stout, of the New York Botanical Garden and for the splendid cooperation of the Fairmont Iris Gardens, Farr Nursery Company, George Ehrle, Hubert Fisher and other enthusiastic collectors of *Hemerocallis*.

DAYLILIES IN THE DISPLAY GARDEN AT THE FLORIDA AGRICULTURAL EXPERIMENT STATION, GAINESVILLE

Ajax	Domestico	Hume, Emily
Amaryllis	Dwarf Yellow	Hybrida semperfl
Apricot*	Eldorado*	Hyperion*
Aureole*	Erica	Imperator
Austin, Mrs. A. H.*	Estmere*	Kwanso*
Bardsley	Europa*	Ladhams, B.
Baroni*	Flamid*	Lady Fermoy Hesketh*
Bagdad*	Flavinia*	Lemon Queen*
Bay State*	Florham	Lemona
Bijou*	Gem, The	Linda*
Bowles, EA*	Gloriana	Lovett's Lemon
Brownie*	Golconda	Lovett's Orange
Burbank*	Gold Dust*	Luteola*
Burmah	Gold Imperial*	Luteola major
Byng of Vimy	Gold Standard	Luteola palens*
Calypso*	Golden Bell	Mandarin*
Chengtu*	Golden Dream	Mann, Mrs. J. R.
Cinnabar	Golden Mantle	May Morn
Citronella*	Golden West	Midas*
Crawford, JA*	Goldeni*	Mikado
Cressida	Gracilis*	Miranda
Curlypate	Guisseppi, Cissy*	Modesty
Dauntless	Gypsy	Mulleri*
Dawn	Harvest Moon	Nocerensis
Dazzler	Hippeastrum*	Ochroleuca*

Ophir*	Rajah*	Tangerine*
Orange Gem	Regel, Dr.*	Taplow Yellow*
Orangeman*	Royal	Vesta
Pale Moon	Salem	Vulcan*
Parthenope	Seith, Mrs.	Virginica*
Patricia	Shirley	Wau Bun
Perry, Gladys*	Sir Micheal Foster	Winsome*
Perry, Iris	Sirius*	Woodlot Gold*
Perry, Marg*.	Serenade*	Wyman, DD*
Perry, Mrs.*	Sonny	Yeld, George*
Perry, Thelma*	Soudan	Yellow Hammer*
Queen of May	Sovereign*	
Radiant	Sunny West	

SPECIES

Hemerocallis aurantiaca	Hemerocallis fulva rosea*
” citrina*	” fulva wild type
” flava*	” middendorffii*
” dumortierii*	” minor No. 3*
” fulva cypriana*	” multiflora*
” fulva maculata*	” thunbergii*

NOTE: Those Daylilies marked with an asterisk, thus *, are deciduous. Most of the unmarked sorts are evergreen throughout the year in Peninsular Florida.

NEWS-LETTERS

To the members of the Society,—

We are having the best November and December rains that this District of Kenya has had in the last 25 years. The Crinums in particular are gorgeous. The Hippeastrums have again been in flower since August.

Dec. 18, 1937,
Kilima Kiu, Ulu,
Kenya Colony

MARY EARLY JOYCE
(MRS. FRANK JOYCE)

To the members of the Society,—

We wish to report that hybrid amaryllis blooms are sold in considerable quantities on the Berlin market as cut flowers. In addition to Mr. Ernst Winter's establishment, at Mahlow, near Berlin, Blankenfelder Chaussee, and not in Mariendorf (Berlin-Mariendorf), there is another famous German grower of amaryllis, Mr. Gustav Seifert, at Dueren, Rheinland. The periodical, Die Gartenwelt, has published illustrations of flowers in the Seifert collection, which contains 5000 flowering plants. Mr. Hahn also mentioned two other establishments that grow amaryllis—Villa Huegel near Essen, Rheinland, and Saxon Staatsgaertneri, Pillnitz, near Dresden.

2. COLOR DESCRIPTION

HAYTER COLOR CHART

Under date of June 18, 1937, Mr. Robert Sealy, of the Herbarium, Royal Botanic Gardens, Kew, writes as follows,—

There is a matter connected with the Fischer Color Chart which may interest you since the American Amaryllis Society has adopted this chart. Did you know that a colour chart on exactly the same lines appeared so long ago as 1825? You will find it at the end of the book that bears the title "Hortus Ericaeus Woburnensis or A Catalogue of Heaths in the Collection of the Duke of Bedford at Woburn Abbey" and which was published in 1825. The chart was designed by George Hayter and differs from the Fischer chart in two ways. First the colours are arranged in a clockwise manner starting with "Purple" (equivalent to the violet of the spectrum) thus Purple, Blue, Green, Yellow, Orange, Red, whereas in the Fischer chart in a clockwise manner they read Red, Orange, Yellow, Green, Blue, Violet, and secondly Hayter has the dark colour outside (at the circumference) and the pale colour inside (at the centre) whereas in the Fischer chart the dark colour is inside and the pale colour outside.

Those who are using the Fischer Color Chart will be interested in this information. It is hoped that the Color Chart in preparation by the Royal Horticultural Society will soon be published for the American Amaryllis Society is planning to adopt this chart as soon as it is ready. The Fischer chart is excellent as a starting point, but is not adequate for advanced work in flower color description.

—*Hamilton P. Traub.*

COLOR PHOTOGRAPHY TODAY

Color photography today is a serious rival of the black and white photograph for methods have been vastly improved over former years. This is brought about by a simple method, the use of color film in a precision camera with highly corrected lenses like the Leica. This makes it an ideal color system for the flower photographer because the equipment is extremely compact and has many accessories adapting it for all types of photography. Not only can close-ups of the plant itself be made but of portions of the plant as well. The film (Kodachrome) is processed by the manufacturer and returned in the form of transparencies which may be projected or reproduced by any color separation method such as Trichrome Carbro, Eastman Wash Off Relief, Lithography, or Letter-press printing. Engravers and lithographers make their separation plates directly from the transparency, which makes the production of printed reproductions extremely simple.

May 7, 1938

*E. Leitz, Inc.,
New York City.*

—GEORGE W. HESSE.

IMPROVEMENTS IN COLOR PHOTOGRAPHY

The use of Type A Kodachrome permits flower pictures to be taken indoors under artificial light conditions with no special equipment. Photoflood bulbs are used for the lighting and produce excellent color correction. Taking flower pictures indoors often permits the use of special effect lightings which heighten the impact and effectiveness of the pictures.

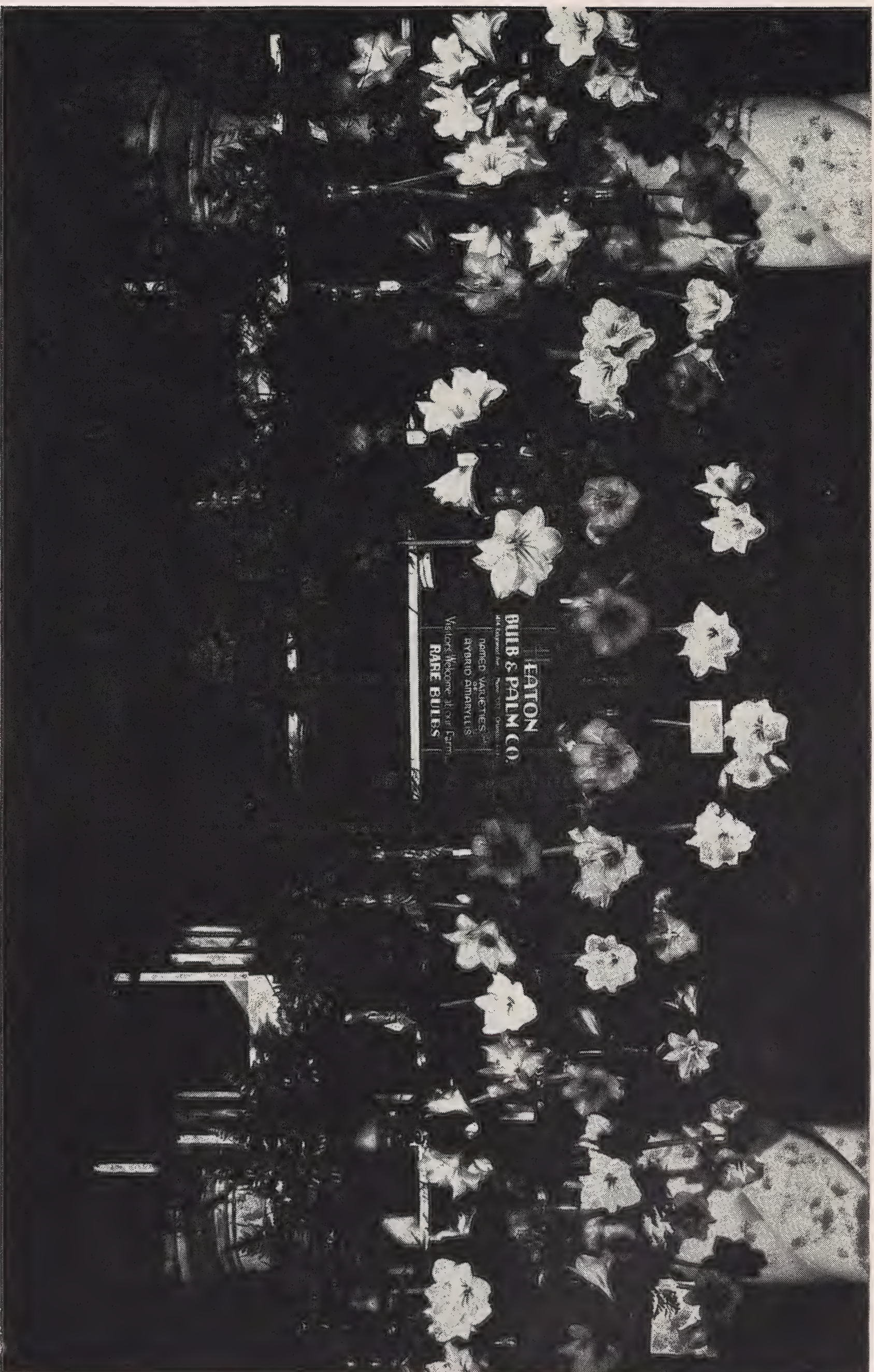
Type A Kodachrome is the latest development made by this company in natural color processes for the amateur. We are, of course, from time to time bringing out improved Kodaslide Projectors, improved means for mounting Kodachrome transparencies, and filing equipment which helps the flower lover keep his color picture collection in order.

*April 26, 1938,
Eastman Kodak Co.,
Rochester, N. Y.*

—D. R. BROWN.

 COLOUR DESCRIPTIONS OF FLOWERS

“The only practicable solution of the problem of accurate colour description would appear to be the production of a reliable horticultural colour chart, suitable for general use,” says the Gardeners’ Chronicle editorially (London, March 21, 1937). “In order to ascertain whether this could be accomplished within reasonable limits, I have matched some 500 flowers of all types with some of the best charts at present available—Ridgway’s and The Repertoire of Oberthur in particular—and from the results gained it does appear that flower colours can be gathered into a moderate number of colour groups, and that while it may be impossible to describe every tone and tint in such a variable flower as the rose, for instance, or even a lilac bloom, the ‘general hue’ can be ascertained with a marked degree of accuracy, thus eliminating the ‘personal element,’ which is the cause of so many pitfalls It may be seen that a carefully graduated colour chart with which to match flowers accurately is not an impossibility. Minute description of every tone and hue is not possible or even feasible, but if the ‘general hue’ of the flower can be accurately described, it should be sufficient for catalogue purposes. Other factors for the success of such a chart would be that the price should be reasonable and the make-up easy to handle, and lastly, but certainly not the least important, that such a chart would be recognized as the standard work on the subject and used uniformly by all who have to do with flower description (Marguerite E. Bunyard).”



American Amaryllis Society

See page 89

I. W. Heaton Exhibit at the Southeastern Amaryllis Show, Orlando, Fla., 1938

HEXANDRIA MONOGYNIA. 293

5. **AMARYLLIS** spatha uniflora, corolla inæquali, ge-
nitalibus declinatis. *Hort. cliff.* 135. *Hort. ups.* 75.
Act. stockb. 1742. p. 93. t. 6. *Roy. lugdb.* 36.
LilioNarcissus jacobæus, flore sanguineo nutante. *Dill.*
elth. 195. t. 162. f. 196.
Narcissus jacobæus major. *Rudb. clys.* 2. p. 89. f. 10.
Habitat in America meridionali. ♀
4. **AMARYLLIS** spatha multiflora, corollis campanula-
tis æqualibus, genitalibus declinatis. *Hort. cliff.* 135.
Roy. lugdb. 36.
LilioNarcissus polyanthos, flore incarnato: fundo ex lu-
teo albescente. *Sloan. jam.* 115. *hist.* 1. p. 244. *Seb.*
thes. 1. p. 25. t. 17. f. 1.
Lilium rubrum. *Merian. surin.* 22. t. 22.
Habitat in Caribæis, Barbados, Surinama. ♀
5. **AMARYLLIS** spatha multiflora, corollis revolutis, *sarniensis.*
genitalibus strictis. *Hort. ups.* 75.
Amaryllis spatha multiflora, corollis æqualibus patentis-
simis revolutis, genitalibus longissimis. *Hort. cliff.* 131.
Roy. lugdb. 36.
Narcissus japonicus, rutilo flore. *Corn. canad.* 157. t.
158. *Rudb. clys.* 2. p. 23. f. 14.
Lilium sarniense. *Dagl. monogr.* t. 1. 2.
Habitat in Japonia, nunc in Sarniæ insula Angliæ. ♀
6. **AMARYLLIS** spatha multiflora, corollis campanu-
latis æqualibus, scapo tereti ancipiti. *Roy. lugdb.* 36.
LilioNarcissus zeylanicus latifolius, flore niveo externe
linea purpurea striato. *Comm. hors.* 1. p. 73. t. 73.
7. *LilioNarcissus africanus*, scillæ foliis, flore niveo linea
purpurea striato. *Ebret. pict.* 5. f. 2.?
Habitat in Zeylona. ♀
7. **AMARYLLIS** spatha multiflora, corollis campanu-
latis æqualibus, scapo compresso longitudine umbellæ.
Roy. lugdb. 36.
Lilium africanum humile, longissimis foliis, polyanthos
saturato colore purpurascens. *Herm. parad.* 195. t.
195.
Habitat in Æthiopia. ♀
8. **AMARYLLIS** spatha multiflora, corollis inæqualibus, *orientalis.*
foliis linguiformibus. *Bætt. canon.* 215.
Amaryllis spatha multiflora, foliis ovato-oblongis obtu-
sis. *Roy. lugdb.* 37.

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See pages 101 and 135.

Page 293, Linnaeus' *Species Plantarum*, First Edition, 1753, the foundation of the Genus *Amaryllis* with *A. belladonna* as its present leading species which is clearly an American and not a South African species.

3. DESCRIPTION AND PHYLOGENY

THE HISTORY OF NOMENCLATURE—AMARYLLIS (LINN.) HERB., AND HIPPEASTRUM (HERB.)

J. C. TH. UPHOF,

Professor of Botany, Rollins College, Winter Park, Florida

In the Family, *Amaryllidaceae*, there are two genera of great interest to us that have been known for over a century as *Amaryllis* (Linn.) Herb., and *Hippeastrum* Herb. However, a thorough search of the literature has yielded evidence that makes this nomenclature untenable. During the summer months of 1936, I studied in the Library of the Royal Botanical Garden at Kew, and again in 1937, in the Library of the United States Department of Agriculture and the Library of Congress at Washington, D. C. in order to examine the literature on these two genera from the earliest times up to the present in the hope of clearing up any inaccuracies in their nomenclature.

According to Pax and Hoffman¹, both genera belong to the subfamily *Amaryllidoideae* although each one is grouped under a different subtribe. *Amaryllis* (Linn.) Herb., together with some other genera, is grouped under *Amaryllidinae*, whereas *Hippeastrum* Herb., is classed with the *Hippeastrinae*. Phylogenetically, it is clear that they are at a distance from each other. It is not a question of relationship that is involved but a matter of incorrect naming of the genera. At the present it is understood that the Genus *Amaryllis* (Linn.) Herb. is monotypic, namely, *A. Belladonna* (Linn.) Ait. which is found in South Africa. *Hippeastrum* (Herb.) is composed of about 74 species which are all found in the tropics and subtropics of America, namely from the West Indies to Chile and southern Brazil into a part of Argentina. Many beautiful garden hybrids originated from some of these species in which nurserymen were already interested at the beginning of last Century. Many growers still call them *Amaryllis* instead of *Hippeastrum* and apparently they may be right.

The genus *Amaryllis* can be dated back to Linnaeus' *Species Plantarum* Ed. Prim.² Here he mentions 9 species (See Plate 107.) The great Swedish botanist expressly wished to supersede Tournefort's *Lilio-narcissus*³ which he rejected as a compound word. These 9 original Linnean species are: 1. *A. lutea* (= *Sternbergia lutea* Ker.—Grawl. ex. Schult. qq. Syst. VII, 795), 2. *A. atamasco* (= *A^tamasco atamasco* Herb. App. Bot. Reg. 36), 3. *A. formosissima* (= *Sprekelia formosissima*

¹F. Pax und K. Hoffman, *Amaryllidaceae* in Engler and Prantl. Die Natürlichen Pflanzenfamilien. Vol. 15 a: 404-406, 415-416, Leipzig, 1930.

²Carolus Linnaeus. *Species Plantarum*. Tom I: 292-294, Ed. Prim. Holmiae, 1753.

³J. P. Tournefort. *Institutiones Rei Herbariae*. Tom. I: 385, Pl. 207. Parisiis, 1700 as to the origin of the generic name *Amaryllis* see also:

Carolus Linnaeus. *Generum Plantarum*. 102. Lugduni Batavorum. 1737.

Carolus Linnaeus. *Critica Botanica*. 30 and 118. Lugduni Batavorum. 1737.

Carolus Linnaeus. *Philosophia Botanica*. 140 and 170. Stockhalmiae. 1751.

On page 170 of the latter work Linnaeus states: "Nomina generica Poetica, Deorum ficta, Regum consecrate, & Promotorum Botanices promerita, retineo." Then under the heading "Poetica in veterum eruditione trita": he mentions among other genera also *Amaryllis*.

Herb. App. Bot. Reg. 35), 4. *A. Belladonna* which is the only name, though not the same plant that is left, 5. *A. Sarniensis* (= *Nerine Sarniensis* Herb. amaryllidae 2073), 6. *A. zeylanica* (= *Crinum zeylanicum* Linn. Syst. Ed. XII, 236), 7. *A. longifolia* (= *Crinum longifolium* Roxb. Hort. Beng. 23 Fl. Ind. II, 130), 8. *A. orientalis* (= *Brunsvigea gigantea* Heist. Beschreib. Brunsv. 3 cum LC fide Schoet. f. Syst. VII, 844.), 9. *A. guttata* (= *Buphane guttata* Herb. Amaryllidae 240). In the second edition of the work of Linnaeus we find the addition of another species, namely of *Amaryllis reginae* which later became *Hippeastrum reginae* Herbert.⁴

At first our interest will be mainly centered on *Amaryllis Belladonna* (Ait.). Prior to his *Species Plantarum*, Linnaeus published his monumental work *Hortus Cliffortianus*⁵. Here he describes a plant which we can easily trace as *A. equestre* Ait. (= *Hippeastrum Equestre* Herb.) and which we will see later on is nothing more than *A. Belladonna* Ait. Linnaeus states: "Amaryllis spatha multiflora, corollis campanulatis, aequalibus, genitalibus declinatus." This statement he takes exactly over in his *Species Plantarum* Ed. Prim., where he uses for the first time the scientific system of giving plant species two names. It is to this description that he attaches the name of *Amaryllis Belladonna* and according to the rules of nomenclature this name is still valid.⁶ In both works Linnaeus mentions that this *A. Belladonna* is native to the West Indies and Surinam—"Habitat in Caribaeis, Barbados, Surinama." Clearly he refers Hermann's "Lilium Americanum puniceo flore dictum"⁷ in his *Hortus Cliffortianus* to this same species. I examined this work of Hermann and found opposite page 194 a very clear illustration of the plant. It is also this very particular description and illustration which is referred to by Aiton⁸ when he named his *Amaryllis equestris* which became later on *Hippeastrum equestre*.

In all the three editions of *Species Plantarum*, Linnaeus is very clear as to what he understands about the country of origin of his *A. Belladonna* by citing also the description of other writers. We find namely: "Lilio Narcissus polyanthos, flore incarnato, fundo ex luteo albescente. Sloan. jam. 15, hist. 1 p. 244. Seb. thes. 1 p. 25 t. 17. f. 1. Lilium rubrum Meriam Surin. 22 t. 22." Inasmuch as the nomenclature of this plant group is so important I examined in various libraries the original works mentioned by Linnaeus. Sloane is especially concerned about the plants of Jamaica⁹. Seba¹⁰ describes and illustrates in his beautiful large folio work the plant in question in Latin and also in Old-Dutch very clearly as "Leli, uit America, met bruin roode bloemen,

⁴Carolus Linnaeus. *Species Plantarum*. Tom. I: 420-422, Ed. Sec. Holmiae, 1762.

⁵Carolus Linnaeus. *Hortus Cliffortianus*. 135, Amsterdam, 1737.

⁶Carolus Linnaeus who wrote his *Plantae Africanae* 77-112 and *Flora Capensis* 113-115 in *Amoenitates Academicæ*, Tom. VI, 1789 mentions among the *Amaryllis* species only *A. capensis* which was later on referred to as *Hypoxis stellata* in Linn. fil. Suppl.

⁷Pauli Hermannii. *Paradisus Batavus seu descriptio rariorum plantarum*. 194, Lugduni Batavorum (Leiden), 1707.

⁸William Aiton. *Hortus Kewensis*. Vol. 1, 417, London, 1789.

⁹Hans Sloane. *Catalogus Plantarum quæ in Insula Jamaica*. 115, Londini, 1696.

¹⁰Albertus Seba. *Locupletissimi Rerum Naturalium Thesauri*. Tom. I: 25. Tab. XVII Amsterdam, 1734.

Bella-donna geheeten'' (meaning: ''lily from America with brownish red flowers, called Bella-donna.''). His Plate XVII is very exact and there is no doubt that Seba means the plant later described as *A. equestris* Ait., which is *A. Belladonna* Linn. from South America.

Of much value, as we will see later on is the account given by Marie Merian¹¹. Her work contains, to a considerable extent, descriptions and illustrations of insects from Surinam or Dutch Guiana. She mentions also, several plant species (See Plate 108). About *Amaryllis* she writes: ''Une bulbe blanche porte ce lys que croit dans la campagne sans etre cultivé, ses feuilles qui sont vertes ont un lustre comme le satin, on en ignore les qualités, j'en ai apporté quelques bulbes en Hollande, ou elles ont porté les fleurs avant les feuilles.''

I should also mention that Linnaeus cites in his Hortus Cliffortianus the work of Plukenet¹² who gives this plant the name of ''*Lilio-narcissus Americanus punico flore Bella-donna dictus.*'' Thus there is not the slightest doubt from what continent this *Bella-donna* comes. We find the same description in Linnaeus' Species Plantarum. In this connection it is worth while to mention the book by van Roijen,¹³ although this writer does not mention the country of origin. We find here mainly an enumeration and some descriptions of plants that were grown in the Botanical Garden of the University of Leiden. Willdenow who later edited the fourth edition of Species Plantarum¹⁴ after Linnaeus' death, has made no alterations as to the country of origin of *Amaryllis Bella-donna* Linn. In fact he adds to the descriptions its German name, namely that of ''West Indische Amaryllis'' which makes the matter still clearer. Thus far the matter is very clear, namely we have here to do with *Amaryllis Belladonna* Linn of American and certainly not from South African origin. On the other hand it should be remembered that Linnaeus' Species Plantarum, Ed. Prim. (1753) forms the foundation for our present nomenclature of plants and this is recognized by every botanist. It should also be mentioned that none of the authors, cited in the works of Linnaeus have ever been doubted as to the correctness of their descriptions.

In 1775 Linnaeus¹⁵ published some plants from Surinam or Dutch Guiana. Among these is mentioned an ''Amaryllis 98 dubia Mer. surin. t. 22 Corolla basi laciniarum barbatum.''' This collection of plants was presented to Linnaeus by the King of Sweden. Among these plants were 30 new genera and 50 new species. They were later on fully described in the Supplementum Botanicum of Linnaeus the younger in 1781. Then, still later (1789), this Amaryllis species was described by Aiton¹⁶ as *Amaryllis equestris*. In the same publication he gives the name *Amaryllis belladonna* to another plant but the habitat is not indicated.

¹¹Marie Sybille de Merian. Historie Générale des Insectes de Surinam. Tom. I: 22. Tab. XXII, Paris 1772. There is an earlier edition: Dissertatio de Generatione et Metamorphosis Insectorum Surinamensis.

¹²Leonard Plukenet. Almagestum Botanicum. Tom. II: 220 Londini, 1700.

¹³Adriani van Roijen. Florae Leydensis exhibens plantas quae in Horto Academicae. 36 Lugduni Batavorum, 1740.

¹⁴C. W. Willdenow in Carolus Linnaeus' Species Plantarum. Tom. II: 54-55, Ed. Quarte Berolini, 1799.

¹⁵Carolus Linnaeus. Plantae Surinamensis in Amoenitates Academicae. Tom. VIII: 254, 175.

¹⁶William Aiton. Hortus Kewensis. Vol. I: 417, London, 1789.

Later Herbert followed this up by indicating the habitat as South Africa. However, Pulle¹⁷ who is at the present one of the best authorities on the flora of Dutch Guiana mentions but one species of *Hippeastrum* (= *Amaryllis*), namely *H. equestris*. This proves when examining and comparing the older publications critically that *A. Belladonna* Linn., and *A. equestris* Ait. are (*Hippeastrum equestre* Herb.) two names for the same plant.

It is plain, therefore, that the beginning of the misconception regarding *Amaryllis belladonna* Linn. (Type: Caribbean Islands; Barbados; and Surinam: Hermann, t. opp. p. 170; 1707; Seba, t. 17, 1734; Merian, p. 22, t. 22, 17—; Linn. Sp. Pl. 1753) dates from 1789 when, in the first edition of *Hortus Kewensis*, specific rank, *Amaryllis equestris*, was given to “*Amaryllis* 98 dubia, mer. surin. t. 22,” described by Linn. patr. in 1775 and Linn. fil. in 1781. It is notable, that the country of origin (West Indies and Surinam) of *A. belladonna* Linn., is omitted in the first edition of *Hortus Kewensis*, but is restored in the second edition, 1810-13, as “West Indies” in general harmony with Linnaeus’ original description in 1753, *Species Plantarum*, the two succeeding editions, and the fourth edition by Willdenow in 1799.

The publication by Savage, in *Herbertia* 1937, of a summary of “A manuscript by the Younger Linnaeus dealing with Certain Genera now included in the Amaryllidaceae,” roughly dated 1782-83, and that remained unpublished until the recent summary appeared, throws some light on this subject. This manuscript of the Younger Linnaeus was authority for certain specific diagnoses in the first edition of *Hortus Kewensis*, 1789, including *A. equestris* (Merian. Surinam. p. 22, t. 22) and *A. belladonna* (Trew. Seligmann, t. 12). It is clear from reading the summary by Savage that when the second edition of *Hortus Kewensis* was published, 1810-13, the fourth edition of *Species Plantarum* by Willdenow, 1799, was used as authority for certain citations in place of the manuscript of the younger Linnaeus. It is natural, therefore, that in this second edition of *Hortus Kewensis*¹⁶, the habitat of *A. belladonna* Linn., is indicated as “West Indies” in harmony with Willdenow (1799) in spite of the fact that a colored plate of a plant, by an anonymous artist, wrongly labeled “*A. belladonna* Linn.,” had appeared in Curtis’ *Botanical Magazine* in 1804.

Unfortunately, in 1821, the late great William Herbert, who undoubtedly was sincere in wanting to carry out the supposed wishes of Linnaeus patr., disregarded the authority of the first and the three succeeding editions of *Species Plantarum*, 1753, 1762, 1764, and 1799, and followed the first edition of *Hortus Kewensis*, instead of the second edition of the latter work, 1810-13, in which the error regarding *A. belladonna* Linn., based on the unpublished manuscript of the Younger Linnaeus, was corrected.

One of the earliest colored plates labeled “*Amaryllis Belladonna* (Linn.)” is found in Curtis *Botanical Magazine*.¹⁸ Here, however, we

¹⁷A. A. Pulle. An Enumeration of the Vascular Plants known from Surinam. 100-101 Leiden, 1906.

¹⁸Anonymous. *Amaryllis Belladonna*. Curtis *Botanical Magazine*. Vol. XIX. Plate 733, 1804.

come to some mix-up as to the origin of this species. Two forms are here described; form (a) "was introduced into this country (namely England) from Portugal in 1712 but where native is yet doubtful. The older botanists call its country India which with them may mean East Indies, South America or even some parts of Africa," as to form (b) we read that it ". . . comes from the Cape of Good Hope where it was found by Sir Joseph Banks." Judging from the colored plate and from the description this is by no means the plant which Linnaeus had so clearly in mind. It is interesting to note that a few years later Aiton does not mention the country of origin of *A. Belladonna* in his *Hortus Kewensis*, first edition. In the second edition which was published in 1811¹⁹ it is stated that the plant is from the West Indies in accordance with Linnaeus.

Soon afterward came Herbert²⁰ who changed the nomenclature of *Amaryllis* and *Hippeastrum* as already indicated. He was correct in separating the American species from the South African one from a morphological standpoint, because there are sufficient reasons to treat them as two different genera, but there was no foundation for the nomenclature that was followed, because *Amaryllis Belladonna* was based by Linnaeus distinctly on an American species and the name cannot be transferred to another species. Herbert states²¹: "Many years ago, when in a letter published in the Hort. Soc. Trans. I first distinguished this genus (*Hippeastrum*) from the plants with which it had been confounded, I retained for it the name *Amaryllis*, and proposed that of *Coburghia* for *Belladonna* and *Blanda*. I was not then aware that Linnaeus had given the name *Amaryllis* to *Belladonna*, with a playful reason assigned; but as soon as I learned it, I felt, besides the general law of priority, that the jeu d'esprit of a distinguished man ought not to be superseded and that no continental botanist would submit to the change. I therefore restored the name *Amaryllis* to *Belladonna*, and gave that of *Hippeastrum* or Equestrian Star to this genus following up the idea of Linnaeus when he named one of the original species equestre." There is no doubt that the reader will be aware of some inaccurate and doubtful statements.

Let us now look at the problem from another angle and let us trace the various statements found in the literature concerning the South African plant which Herbert erroneously calls *A. Belladonna*. As early as 1633, the well known Ferrari²² describes a bulbous plant as "Narcissus Indicus, flore Liliaeaceo, diluto colore purpurascens" together with an excellent illustration on page 121. It is very suggestive that Ferrari may have meant the disputed species from Cape of Good Hope. Let us go somewhat further. Herbert states: "Barrelius had previously, in the year 1714, described the pink and white belladonna, as cultivated by that name in the gardens of Italy, and to the plant of Barrelius both Merian and Linnaeus alluded. It was the exquisite blending of pink

¹⁹William Aiton. *Hortus Kewensis*. Sec. Ed. Vol. II: 225, 1811.

²⁰William Herbert in App. Botanical Register. 31, 1821.

²¹William Herbert. *Amaryllidaceae*. 114-151, London, 1837. See also J. G. Baker. An Enumeration and classification of the Species of *Hippeastrum*, Journ. Bot. 7:79-85, 1878 and his Handbook of the *Amaryllidaceae*. London, 1888.

²²Bapt. Ferrarii. *Florvm Cvltvra*. 117-118, Plate p. 121, Romae, 1633.

and white in the flower, as in the female complexion, that suggested the common name in Italy, and to those lovely tints Linnaeus referred, when he assigned to it the name of a beautiful woman." We notice that Herbert is quite fanciful in his statements which are not in harmony with those of previous botanical writers, including Barrelius, whom he mentioned. Barrelius²³ mentions only "Lilio narcissus indicus dilute purpurescens asceris Belladonna Italiorum vulgarior."

Herbert further says "It is equally clear, that this genius *Hippeastrum* is quite distinct from *Amaryllis*, and as belonging to a different section of the order, it has no proximate affinity to it." Then on page 275 of his work on the *Amaryllidaceae*, he described *A. Belladonna* Linn., as a species from Cape of Good Hope, referring to Linnaeus work, *Hortus Cliffortianus*, in which the binary nomenclature was not used. And further, the works of Ferrari and Barrelius are not mentioned by Linnaeus. The idealistic and fanciful views of Herbert which have been cited above in order to switch *A. Belladonna* Linn., from an American to a South African species can not be maintained. Herbert himself who realized that "... the general law of priority, the jeu d'esprit of a distinguished man ought not to be superseded" would not have objected to one of our principal rules of nomenclature, namely—"No one may change a name (or combination of names) without serious motives, based either on more profound knowledge of facts or on the necessity of giving up a nomenclature that is contrary to the Rules," and (Recommendation III.) "Changes in nomenclature should be made only after adequate taxonomic study".²⁴

Perhaps we should not overlook the statement of Beaton²⁵, who knew Herbert personally—"When the late Dean of Manchester had split up into fragments the mass of bulbous plants which formerly passed as species of *Amaryllis*, and divided them into separate genera, which he distributed into different sections of the order, I well remember the discontent and heart-burnings which obtained among many of our best bulb growers with his arrangement, and these lamentations forced strongly upon the mind the different ideas of utility entertained by botanists and gardeners. The arrangement was certainly not very flattering to those who would let well alone, and yet it was so mysterious to the grumblers that they feared to show their opposition to it in public print."

As far as the plant from Cape of Good Hope is concerned, *Amaryllis belladonna* (Linn.) Herb., we must find a name for it. Since the date when Herbert proposed to segregate *Hippeastrum* from *Amaryllis* in 1921 the name of *Callicore* by Link²⁶ was published in 1829. The species here concerned is *Callicore rosea* Link, which was described as having reddish-white flowers and native to the Cape (am Cap), and this is identical with *A. Belladonna* (Linn.) Ait. The genus of *Belladonna*

²³Jacobo Barreliero. *Plantae per Galliam, Hispaniam et Italiam*. p. 70, Obser. 787, Ic. 1040, Parisiis, 1714.

²⁴J. Briquet and H. Harms. *International Rules of Botanical Nomenclature*. 3 Jena, 1935.

²⁵D. Beaton. *On Amaryllids*, Jour. Hort. Soc. 5:132-136, 1850.

²⁶H. F. Link. *Handbuch zur Erkennung der Nutzbartsen und am häufigsten vorkommenden Gewachse*. 193, Berlin, 1829.



See page 103.

One of the earliest illustrations of *Amaryllis Belladonna* from Marie Sybille de Merian, *Histoire Générale des Insectes de Surinam*. Tom. I:22. Tab. XXII, Paris 1772. There is an earlier edition of this work in Latin, with the same plates, to which Linnaeus refers.

Plate 108



F. Meyer, Hamburg, Germany

See page 157

Vallota purpurea major—two year old plant, grown in living room;
height 2 feet

Plate 109

was soon afterward proposed by Sweet²⁷ and the name of *Belladonna purpurescens* Sweet is given to *A. Belladonna* (Linn.) Ait. This *Belladonna* is homonymous with *Belladonna* Tournefort, Rupp. Flora Jen. ed. Hall. 252 (1745), the present *Atropa Belladonna* Linn., which belongs to the *Solanaceae* or Nightshade Family.

The name *Callicore rosea* Link., is the only name that can be maintained for this species of the Cape of Good Hope and for which plate 911, in Flore des Serres, is an excellent example²⁸. As far as the distribution of the species (under the name of *Amaryllis Belladonna* (Linn.) Ait., is concerned I refer to the works of Thiselton-Dyer²⁹ and of Levyns³⁰.

There is in the Herbarium of The Linnean Society of London no material from Linnaeus for comparison and therefore we have to rely upon the above publications.

CONCLUSIONS

(a) *Amaryllis belladonna* of Linnaeus is an American species and not South African; (b) The plant mentioned by Linnaeus as *Amaryllis 98 dubia* and which later on was named by Aiton as *Amaryllis equestris* is *Amaryllis belladonna* Linn. The latter name, the oldest, is to be maintained, and the former has to be rejected; (c) The generic name *Amaryllis* founded by Linnaeus in 1753 has to be maintained for the American group of plants, and this *Amaryllis belladonna* Linn. (syn. *Amaryllis equestris* Ait.) is the leading species with which all others of the genus have to be compared; (d) The name *Hippeastrum* suggested by Herbert in 1821, is superfluous and becomes a rejected name; and (e) The Herbertian "*Amaryllis belladonna*" from the Cape becomes automatically *Callicore rosea* Link.

Amaryllis belladonna Linn. et *Callicore rosea* Link

Amaryllis belladonna Linnaeus species americana, non africano-australis est. *Amaryllis 98 dubia* L. et *Amaryllis equestris* Aiton revera sunt *Amaryllis belladonna* L.; quare hoc ultimum nomen omnino conservandum, alia autem nomina rejicienda. Nomen deinde generis a Linnaeo anno 1753 propositum, quoad has plantas americanas, retineri debet et haec *Amaryllis belladonna* Linn. (syn. *Amaryllis equestris* Ait.) typica est species cui omnes aliae eiusdem generis species comparantur. Opus non est nomine Hippeastro, sicut à Herbert anno 1821 proposito, ideoque rejiciendum est hoc nomen; atque eo ipso *Amaryllis belladonna* Herbert, non L. ex cap. bonae spei designari debet *Callicore rosea* Link.

²⁷Robert Sweet. Hortus Britannicus. 2 ed. 506, London, 1830. See also:

C. G. De Della Torre et H. Harms. Genera Siphonogamarum. 74, Lipsiae, 1900-1907. Index Kewensis. Tom. I. 387, Oxoni, 1895.

²⁸J. E. P(lanchon) *Amaryllis Belladonna*. Flore des Serres et des Jardins de l'Europe. Plate 911, 1853.

²⁹W. T. Thiselton-Dyer. Flora Capensis. Vol. VI: 203, London, 1896-1897.

³⁰M. R. Levyns. A Guide to the Flora of the Cape Peninsula. 73. Cape Town, 1929. N. B. When this manuscript was finished Dr. A. A. Pulle, Professor of Botany at the University of Utrecht, Netherlands, who is working on his extensive "Flora of Surinam" stated to me in a letter dated Sept. 7th, 1937 "... dat H. equestre de eenige soort van Hippeastrum is, die in Suriname is verzameld." (... that H. equestre is the only species of Hippeastrum which has been collected in Surinam.") This statement is very important in relation to the literature of the 18th Century.

THE TRIBES OF THE AMARYLLIDACEAE

HAMILTON P. TRAUB, *Florida*

The *Amaryllidaceae* have on the whole received scanty attention since the appearance of Herbert's classical text in 1837, and if we may borrow a phrase from Colonel Grey, the whole family is "crying out loud for a monograph." It is true that Baker in 1888, fifty years after Herbert, devoted a monograph to the family, following Herbert and Benth & Hooker but it also is quite out of date after the lapse of another fifty years.

The classification of Pax and Hoffman deals with the genera only on the basis of an extensive poly-phyletic family grouping. Fortunately, Dr. Hutchinson in 1936 published his stimulating work, "Families of Flowering Plants, Monocotyledons." Following Jussieu (1789) the relative position of the ovary as a criterion in separating the *Liliaceae* and *Amaryllidaceae* from one another has been courageously abandoned, and the importance of the umbellate flowering habit and the presence of an involucre of bracts as the chief characteristics of the amaryllids, is emphasized. This is the first great advance toward a better understanding of this family since Herbert's time, a century ago.

It may be that Dr. Hutchinson has not gone far enough, however, since the Lily Family is still a very diverse aggregation. The *Hemerocallideae*, for instance, are indicated as showing further evolution toward the *Amaryllidaceae* and the Tribe *Tulipeae* of the *Liliaceae*. However, typical species of the *Tulipeae*, *Lilium*, *Tulipa*, etc., have a meristematic condition of the leafy scales of the bulb and are to be considered more primitive than typical species of the *Hemerocallideae* that lack this character. In this particular the *Hemerocallideae* are similar to the *Amaryllidaceae*. Dr. Hutchinson is apparently justified, on the basis of morphological characters, as well as such evidence as has just been mentioned, in considering the *Hemerocallideae* as a primitive ancestral stock from which the *Amaryllidaceae* may have originated. It is not apparent, however, that the *Tulipeae* should have regained the capacity to produce meristematic tissue in the leaf scales after evolving from the more highly specialized *Hemerocallideae* that do not possess this capacity.

We may therefore consider the *Hemerocallideae* as quite closely related to the *Amaryllidaceae* as a whole, but lacking the umbellate flowering habit. A truly phylogenetic classification of the *Amaryllidaceae* therefore would include the *Hemerocallideae* as the most primitive Tribe, a precedent set by Jussieu (Nat. deposito, etc. 1789), and Jaume-Saint Hilaire (Exp. fam. nat. 1805), who both classed *Hemerocallis* under the *Amaryllidaceae*. In the classification here proposed, the *Hemerocallideae* are considered from this standpoint.

The writer has studied living material of amaryllids for over a quarter century, and has taken notes with the object of preparing a phylogenetic and taxonomic monograph. It was his intention to delay publication for quite some time, but the need for this is now so very urgent that publication will take place within a year or so. The present

brief article was prepared to (a) provide an up-to-date classification of the Tribes for immediate use, (b) make the necessary changes in nomenclature due to the researches of Dr. Uphof, and (c) clear up the anomaly with reference to the Hutchinsonian Tribes *Crineae* and *Amaryllideae*.

In preparing the classification, an attempt has been made to do so on an evolutionary basis rather than that of an artificial key. It is recognized that evolution has apparently taken place from (1) rhizome to corm and bulb; (2) leafy scape to leafless scape; (3) many to two, or single spathe valves; (4) free to tubular spathe valves; (5) many to few or single flowered umbel; (6) actinomorphic to zygomorphic androecium; (7) absence to presence of the corona; (8) numerous to few or single ovules.

Such evolutionary developments have not taken place uniformly in the various branches of the Family and classification is therefore difficult, especially if an artificial key is desired. For the present the classification is presented along natural lines with an indication of the exceptions to be encountered. The basic chromosome numbers (*n*) are indicated, as far as known, for each of the tribes, but this data is still quite meager so that no definite conclusions can be based on this evidence.

Since *Hippeastrum* is now a rejected name, the use of the tribe name *Hippeastreae* based on it would be a source of confusion, and therefore the new tribe name *Amarylliseae*¹ is proposed for the group comprising the genera *Amaryllis* (Linn. ex parte) Uphof, *Placea*, *Sprekelia*, *Lycoris* and *Vagaria*. In the artificial key of Dr. Hutchinson, the tribes *Crineae* and *Amaryllideae* overlap. A convenient natural grouping can be secured by dividing the genera included in the two tribes on the basis of seed structure—seeds sub-globose to globose (*Stenolirion*, *Crinum*, *Ammocharis*, *Callicore*, *Brunsvigia* and *Nerine*) as contrasted with seeds flat, usually winged (*Chlidanthus*, *Anoiganthus*, *Cyrtanthus*, *Vallota* and *Ungernia*). Under this classification *Crinum* is transferred to the same tribe with *Callicore*, and the tribe name *Callicoreae*² is proposed for the tribe in place of *Amaryllideae*. For the tribe *Crineae*, which no longer contains the Genus *Crinum*, the name *Cyrtantheae*³ is proposed, a precedent set by Herbert who used the name *Cyrtanthiformes* as a group name for the genera *Cyrtanthus*, *Gastronema*, and *Vallota*.

¹*Amarylliseae* Traub, **Tribus nov.** (*Amaryllidaceae*), [*Amaryllis* (Linn. ex parte) Uphof, *Placea*, *Sprekelia*, *Lycoris*, *Vagaria*].

²*Callicoreae* Traub, **Tribus nov.** (*Amaryllidaceae*), (*Stenolirion*, *Crinum*, *Ammocharis*, *Callicore*, *Brunsvigia*, *Nerine*).

³*Cyrtantheae* (Herb.) Traub, **Tribus nov.** (*Amaryllidaceae*), (*Chlidanthus*, *Anoiganthus*, *Cyrtanthus*, *Vallota*, *Ungernia*).

CLASSIFICATION OF THE TRIBES OF THE AMARYLLIDACEAE

- A. Ovary superior
 - B. Inflorescence racemose or paniculate
($n=6, 11, 30$) ----- 1. **HEMEROCALLIEAE**
 - BB. Inflorescence umbellate
 - C. Rootstock a rhizome ($n=6, 8, 15$) -- 2. **AGAPANTHEAE**
 - CC. Rootstock a corm or bulb
 - D. Androeceum actinomorphic; corona absent ($n=5, 6, 7, 8, 9, 20$) -- 3. **ALLIEAE**
 - DD. Androeceum more or less zygomorphic; the filaments connate; corona usually absent (n undetermined) ----- 4. **GILLIESIEAE**
- AA. Ovary inferior
 - E. Corona usually absent
 - F. Scape leafy in the lower part (n undetermined) ----- 5. **IXIOLIRIEAE**
 - FF. Scape leafless
 - G. Spathe valves usually 2 or more and free from one another; or if monophyllous, split to the base on one side
 - H. Ovules numerous
 - I. Perianth actinomorphic; flowers few or solitary
($n=7, 11, 12$) ----- 6. **GALANTHEAE**
 - II. Perianth usually zygomorphic, flowers many in the umbel
 - J. Seeds sub-globose to globose ($n=8, 9, 11, 12$) ----- 7. **CALLICOREAE**
 - JJ. Seeds flat, winged
($n=8, 12$) ----- 8. **CYRTANTHEAE**
 - HH. Ovules few ($n=8, 9, 11, 12$) ----- 9. **HAEMANTHEAE**
 - GG. Spathe monophyllous, tubular below, upwards free ($n=6, 12, 19$) ----- 10. **ZEPHYRANTHEAE**
 - EE. Corona usually present, separate from the filaments
 - K. Corona of scales; sometimes united at the base ($n=6, 9, 11, 12, 23$) -- 11. **AMARYLLISEAE**
 - KK. Corona of separate scales, or annular or tubular ($n=7, 10$) ----- 12. **NARCISSEAE**

EEE. Corona present, in connection with the
filaments

L. Corona of separate teeth or scales
between the filaments (n unde-
termined) -----13. EUSTEPHIEAE

LL. Corona formed by expanded peta-
loid filaments (n=11, 40, 45) ----14. EUCHARIDEAE

KEY TO THE TRIBES CALLICOREAE AND CYRTANTHEAE

In order to make clear the basis on which the tribes Callicoreae and
Cyrtantheae are here proposed, the following classification is given,—

A. Seeds sub-globose to globose (n 8, 9, 11, 12)TRIBE 7. CALLICOREAE

B. Filaments free and not swollen at the
base

C. Ovules closely sessile on or sunk into
the placentae

D. Flowers subsessile or very short
Seeds many (S. Afr.) ----- 1. *Stenolirion*
Seeds few (Trop. & Subtrop)-- 1a. *Crinum*

DD. Flowers long-stalked
Perianth straight (S. Afr.) -- 2. *Ammocharis*
Perianth declinate(tube short
(S. Afr.) ----- 3. *Callicore*

CC. Ovules more or less stalked on the
placentae (S. Afr.) ----- 4. *Brunsvigia*

BB. Filaments swollen at the base and con-
tinued beyond the point of inter-section
down to the ovary; tepels narrow (S.
Afr.) ----- 5. *Nerine*

AA. Seeds flat, usually winged (n 8, 12) -----TRIBE 8. CYRTANTHEAE

E. Anthers sub-basifixed, stigma trifid
Perianth tube long (S. Amer.) ---- 6. *Chlidanthus*
Perianth tube short (S. Afr.) ---- 7. *Anoiganthus*

EE. Anthers medianly dorsifixed
F. Flowers more or less curved, per-
ianth lobes connected at base by a
callus
Perianth limb much shorter than
the tube (Trop. & S. Afr.) ---- 8. *Cyrtanthus*

FF. Flowers straight
G. Perianth lobes connected at the
base by a callus (S. Afr.) ---- 9. *Vallota*

GG. Perianth lobes not connected at
the base by a callus (Iran) --10. *Ungernia*

TENTATIVE REVISION OF THE GENUS AMARYLLIS (LINN. EX PARTE) UPHOF (SYN. HIPPEASTRUM HERB.)*

HAMILTON P. TRAUB AND J. C. TH. UPHOF

Since the publication of Baker's Handbook of the Amaryllideae in 1888, no less than 43 species of *Amaryllis* have been proposed under the now rejected name of *Hippeastrum*. As to the ultimate validity of these no one can be certain at present for many of them have been proposed without due comparison with the previously described species. In some cases also the descriptions are lacking in essential particulars. It is true that such careful comparisons would have been difficult to make for no attempt at a revision of the Genus was made for a half century. This makes it all the more necessary to bring all of this material together under one roof at this late date.

The purpose of the present paper is not to make final disposition of the numerous newly proposed species, but rather to bring together descriptions of all of these under a tentative classification so that the student as well as the amateur may make use of them. It will help to guide the plant collector and taxonomist, and will also serve to put a damper on the indiscriminate making of new *Amaryllis* species on the very least provocation.

The paper is in two parts. The first concerns the characters of the Genus *Amaryllis*, and the second deals with the key to the subgenera and species and the detailed description of species proposed since 1888.

THE GENUS AMARYLLIS (LINN. EX PARTE) UPHOF

Sealy has recently published a very valuable paper concerning the generic characters of *Zephyranthes*, *Pyrolirion*, *Habranthus* and *Amaryllis* (Jour. Roy. Hort. Soc. May 1937), and we are greatly indebted to him for his excellent work. The Genus *Amaryllis* as here considered coincides with the description of Sealy.

AMARYLLIS (Linn. ex parte) Uphof
(Syn. *Hippeastrum* Herbert)

Spathe of two equal and opposite valves which are simple and quite free from one another to the base; *peduncle* two to several flowered, rarely one-flowered by reduction; *bracts* always present, each flower subtended by a bract; flowers declinate; perianth-segments of four different sizes; stamens declinate, fasciculate, unequal, of four different lengths; stigma trifold or capitate.

All of the species are native to South America, excepting *A. belladonna* (Linn.) Uphof, which is found in the West Indies in addition to Brazil, Guiana, Colombia, Venezuela, Bolivia and Peru.

*See also article on Subgenus *Sealyana* on page 131.

KEY TO SUBGENERA AND SPECIES AND DESCRIPTIONS OF SPECIES PROPOSED SINCE 1888.

The genus as delimited by Baker in 1888 included 35 species under the now rejected name of *Hippeastrum*. These 35 species were reprinted in full in *Herbertia* Vol. 1. 1934 (Year Book American Amaryllis Society), and it is therefore not necessary to repeat these descriptions here. However, the names and synonymy of 34 of the species admitted by Baker are given. Sealy (Jour. Roy. Hort. Soc. May 1937) has transferred *Hippeastrum brachyandrum* to the Genus *Habranthus*, and this leaves 34 species to be dealt with here.

Proposed New Species Since 1888 That Are Apparently Valid

- | | |
|---|--|
| 1. <i>H. ananuca</i> Phil. Chile | 17. <i>H. Gayanum</i> O. Kuntze, Brazil |
| 2. <i>H. angustifolium</i> Phil. Chile | 18. <i>H. granatiflorum</i> Holmb. Uruguay |
| 3. <i>H. angustifolium</i> Pax Argentina | 19. <i>H. iguapense</i> R. Wagner, Brazil. See article page 131. |
| 4. <i>H. araucanum</i> Phil. Chile | 20. <i>H. laetum</i> Phil. Chile |
| 5. <i>H. Bakeri</i> Phil. Chile | 21. <i>H. marginatum</i> Fries, Argentina |
| 6. <i>H. Bonariense</i> O. Kuntze, Argentina | 22. <i>H. Moelleri</i> Phil. Chile |
| 7. <i>H. candidum</i> Stapf, Argentina | 23. <i>H. Muesserianum</i> L. Linden, |
| 8. <i>H. Canterai</i> Arech. Uruguay | 24. <i>H. petiolatum</i> Pax, Argentina |
| 9. <i>H. colonum</i> Phil. Chile | 25. <i>H. popetatum</i> Phil. Chile |
| 10. <i>H. consobrinum</i> Phil. Chile | 26. <i>H. purpuratum</i> Phil. Chile |
| 11. <i>H. crociflorum</i> Rusby, Bolivia | 27. <i>H. Solisi</i> Phil. Chile |
| 12. <i>H. Damazianum</i> Beauvard, Brazil | 28. <i>H. soratense</i> Rusby, Bolivia |
| 13. <i>H. Elwesii</i> C. H. Wright, Argentina | 29. <i>H. splendens</i> Renjifo, Chile |
| 14. <i>H. flammigerum</i> Holmb. Argentina | 30. <i>H. tenuiflorum</i> Phil. Chile |
| 15. <i>H. Forgetii</i> Worsley, Peru | 31. <i>H. tucumanum</i> Holmb. Argentina |
| 16. <i>H. fuscum</i> Kraenzl. Peru | 32. <i>H. viridiflorum</i> Rusby, Bolivia |

Revived Species and Species Transferred from Other Genera

- | | |
|--|---|
| 33. <i>H. andicola</i> (Poepp.) Baker. Chile | 36. <i>H. pallidum</i> (Herb.) Holmb. Argent. |
| 34. <i>H. gladioloides</i> (Hieron) Pax. Argent. | 37. <i>H. platense</i> (Herb.) Holmb. Argent. |
| 35. <i>H. Harrisoni</i> (Bury) Hook f. Uruguay | 38. <i>H. pulchrum</i> (Herb.) Holmb. Argent. |

Species That Obviously Belong to Other Genera

- | | |
|---|---|
| 39. <i>H. Holmbergii</i> Hicken. Argentina | 42. <i>H. tubispathum</i> (syn. <i>Zephyranthella tubispatha</i>) Pax. Argentina |
| 40. <i>H. pedunculatum</i> (Herb.) Holmb. Argent. | 43. <i>H. unifolium</i> (Arech.) Herter. Uruguay |
| 41. <i>H. teretifolium</i> C. H. Wright. Uruguay | |

In addition to the 34 Bakerian species, 43 species proposed since 1888 must be considered. For purposes of convenience, these latter have been grouped into three classes—(a) newly described species since 1888 that are apparently valid, (b) species revived or transferred from other genera, and (c) species that obviously belong to other genera.

Of the 32 species newly described since 1888, 12 species proposed by Philippi, and one species by Carlos Renjifo, are not described in full. The volume of the Anales University of Chile containing these descriptions arrived too late for translations to be made, and these species descriptions will be published in 1939 Herbertia—

Species described by Philippi

H. ananuca
H. angustifolium
H. araucanum
H. Bakeri
H. colonum
H. consobrinum
H. laetum
H. Moelleri
H. popetatum
H. purpuratum
H. Solisi
H. tenuiflorum

Species described by Renjifo

H. splendens

In addition, *H. Forgetii* Worsley also remains unclassified because an adequate description has not as yet been located.

H. pallidum (Herb.) Pax, is evidently a variety of *Amaryllis advena* with the following synonymy—*A. advena* Gawl.; *H. hesperius* Herb.; *H. mendocinus*. This variety differs from the type in having peduncles very much shorter.

Included in the 43 species proposed since 1888, there are 6 species that obviously belong to other genera.

The illustration of *H. Holmbergii* Hicken (page 236, Anal. Soc. Cien. Argent. LV 1903) clearly shows that the spathe is tubular below and the free parts consist of two opposite segments quite free from one another. In this particular it harmonizes with *Pyrolirion*, but the rest of the details do not fit. It may be necessary to create a new genus to accommodate this species, and if this should prove to be the case, the generic name *Holmbergia* is here proposed, in honor of the late Dr. Holmberg who recently passed away, and who had a life long interest in the amaryllids.

H. pedunculatum (Herb.) Holmb., has a "tubular spathe, bifid at the top" and therefore does not belong with the Genus *Amaryllis*.

H. teretifolium C. H. Wright, *H. tubispathum* Pax, and *H. unifolium* (Arech.) Herter,* also have tubular spathes and therefore must be transferred from *Amaryllis*. These four species most likely belong to *Habranthus*.

In the arrangement of the key of the subgenera and species of the Genus *Amaryllis*, an attempt has been made to come closer to a phylogenetic grouping. There are two great evolutionary lines. The linear-leaved species seem to be evolving in the direction of the one-flowered umbel, whereas the lorate-leaved species show a tendency toward the development of the incurved corona that closes in the throat (*Amaryllis aulica*) and pronounced irregularity of the perianth segments (*Amaryllis Cybister*).

In general, evolution, in the Genus *Amaryllis*, seems to be from (a) linear to lorate leaves; (b) many- to few- or single-flowered umbel; (c) narrowly funnel-shaped to openly funnel-shaped perianth; (d) long to short tube; (e) obscure corona of scales to corona enclosing the neck of the throat of the perianth, and (f) trifid stigma to capitate stigma.

Sealy (Jour. Roy. Hort. Soc. May 1937) has raised the Subgenus *Habranthus* (Herb.) Baker to generic rank, and for valid reasons retained the name *Habranthus* for the revived genus. The species which had been erroneously placed under the former subgenus *Habranthus* (Herb.) Baker, and which belong to the Genus *Amaryllis* (Linn. ex parte) Uphof, are therefore without a subgeneric group name. Since most of the species included are native to Chile, the descriptive name *Chilanthé*** is proposed as the new name for the subgenus accommodating those species with linear leaves, short perianth-tube that is openly funnel-shaped, and trifid stigma.

*The name of this species is evidently misprinted as **H. uniflorum** (Arech.) Herter, in Sealy's list (page 209, Jour. Roy. Hort. Soc. May, 1937).

****Chilanthé** Traub & Uphof, **subgenus nov.**, Genus **Amaryllis** (Linn. ex parte) Uphof, **Amaryllidaceae** (**Amaryllis Jamesonii**, **A. Berteroana**, **A. Bagnoldii**, **A. bifida**, **A. advena**, **A. pulchra**, **A. marginata**, **A. lineata**, **A. rosea**, **A. chilensis**, **A. soratensis**, **A. andicola**).

*Tentative Key to the Subgenera and Species of the Genus Amaryllis
(Linn. ex parte) Uphof (Syn. Hippeastrum)*

A. Leaves linear, tube always short

B. Perianth narrowly funnel-shaped SUBGENUS 1. PHYCELLA
(Lindl.)

C. Stigma minutely tricuspidate

- | | |
|------------------------|-----------------------|
| 1. <i>gladioloides</i> | 4. <i>Gayana</i> |
| 2. <i>granatiflora</i> | 5. <i>Herbertiana</i> |
| 3. <i>bonariensis</i> | 6. <i>Elwesii</i> |

CC. Stigma capitate

- | | |
|-------------------|------------------------|
| 7. <i>bicolor</i> | 8. <i>phycelloides</i> |
|-------------------|------------------------|

BB. Perianth openly funnel-shaped; stigma trifid

D. Umbel 3-10 flowered SUBGENUS 2. CHILANTHE (*Traub
& Uphof*)

- | | |
|-----------------------|----------------------|
| 9. <i>Jamesonii</i> | 13. <i>advena</i> |
| 10. <i>Berteroana</i> | 14. <i>pulchra</i> |
| 11. <i>Bagnoldii</i> | 15. <i>marginata</i> |
| 12. <i>bifida</i> | |

DD. Umbel 1-2 flowered

- | | |
|----------------------|-----------------------|
| 16. <i>lineata</i> | 19. <i>soratensis</i> |
| 17. <i>rosea</i> | 20. <i>andicola</i> |
| 18. <i>chilensis</i> | |

BBB. Perianth openly funnel-shaped; stigma capitate SUB-
GENUS 3. RHODOPHIALA (*Presl.*)

E. Umbel 2-6 flowered

- | | |
|--------------------|----------------------|
| 21. <i>montana</i> | 22. <i>pratensis</i> |
|--------------------|----------------------|

EE. Umbel 1-flowered

- | | |
|------------------------|--------------------|
| 23. <i>uniflora</i> | 25. <i>modesta</i> |
| 24. <i>rhodolirion</i> | |

AA. Leaves lorate, tube long or short

F. corona wanting or obscure; perianth tube long or short

G. Perianth-tube long SUBGENUS 4. MACROPODASTRUM
(*Baker*)

- | | |
|---------------------------|---------------------|
| 26. <i>solandriiflora</i> | 28. <i>tucumana</i> |
| 27. <i>candida</i> | |
| 28. <i>viridiflora</i> | 29. <i>tucumana</i> |

GG. Perianth-tube short; stigma trifid SUBGENUS 5. LAIS
(*Salisb.*)

- | | |
|-----------------------|-------------------------|
| 31. <i>Canteraii</i> | 36. <i>petiolata</i> |
| 32. <i>breviflora</i> | 37. <i>flammigera</i> |
| 33. <i>iguapensis</i> | 38. <i>rutila</i> |
| 34. <i>vittata</i> | 39. <i>Damaziana</i> |
| 35. <i>Harrisonii</i> | 40. <i>angustifolia</i> |

FF. Corona intermediate in development, usually of scales, but sometimes fimbriate; perianth-tube short SUB-
GENUS 6. ASCHAMIA (*Salisb.*)

H. Perianth-tube very short, above an inch long; stigma trifid

- | | |
|-----------------------|-----------------------|
| 41. <i>reticulata</i> | 43. <i>reginae</i> |
| 42. <i>belladonna</i> | 44. <i>crociflora</i> |

HH. Perianth-tube $\frac{1}{2}$ to 1 inch long; stigma capitate

- | | |
|----------------------|------------------------|
| 45. <i>stylosa</i> | 49. <i>scopulorum</i> |
| 46. <i>procera</i> | 50. <i>miniata</i> |
| 47. <i>Leopoldii</i> | 51. <i>Andreana</i> |
| 48. <i>Mandonii</i> | 52. <i>Muesseriana</i> |

FFF. Corona incurved, sometimes closing in the throat, perianth-tube short SUBGENUS 7. OMPHALISSA (*Salisb.*)

I. Stigma trifid

- | | |
|-----------------------|-----------------------|
| 53. <i>calyptrata</i> | 56. <i>organensis</i> |
| 54. <i>psittacina</i> | 57. <i>aulica</i> |
| 55. <i>platensis</i> | |

II. Stigma capitate

- | | |
|--------------------|---------------------|
| 58. <i>pardina</i> | 60. <i>Cybister</i> |
| 59. <i>fusca</i> | |

UNCLASSIFIED SPECIES

- | | |
|--------------------------|-----------------------|
| 61. <i>ananuca</i> | 68. <i>laeta</i> |
| 62. <i>Philippiana</i> | 69. <i>Moellerii</i> |
| 63. <i>araucana</i> | 70. <i>popetana</i> |
| 64. <i>Bakerii</i> | 71. <i>purpurata</i> |
| 65. <i>coloniana</i> | 72. <i>Solisii</i> |
| 66. <i>consobriniana</i> | 73. <i>splendens</i> |
| 67. <i>Forgetii</i> | 74. <i>tenuiflora</i> |

SUBGENUS 1. PHYCELLA (*Lindl.*)

1. A. GLADIOLOIDES (Hieron.) Traub & Uphof, comb. nov.; *Habranthus gladioloides* Hieronymus in Bol. Acad. Nac. Cien. Cordoba, iv, p. 70; *Hippeastrum gladioloides* Pax in Beitr. Amaryll. Engl. & Prantl, Natruer. Pfl. Fam. II, 5.

Description.—Bulb unknown; leaves, 8 on the individual, 25 to 30 cm. long, lamina grooved, 2 to 3 mm. wide, linear, obtuse at the top; scape slighter shorter than the leaves, 2 mm. in diameter, flowers in January; umbel 2-5-flowered; spathe-valves 2, $4\frac{1}{2}$ to 7 cm. long, 2 to 4 mm. wide, reddish on dried specimens, slightly united at the base; perianth declinate, pedicels $1\frac{1}{2}$ to $3\frac{1}{2}$ cm. long, frequently with bracts at the base; perianth with a short tube, appendiculate with triangular scales at the throat, these are ciliate-lacerate, $1\frac{1}{2}$ to 2 mm. in length; perianth segments red, somewhat unequal, $3\frac{1}{2}$ to 4 cm. long; stamens longer than the perianth, anthers oblong, $2\frac{1}{2}$ mm. long, 1 mm. wide; style much longer than the stamens; stigma obscurely trifid; ovary 4 to 5 mm. long with ovules numerous, compressed in the cavities.

Habitat.—Argentina, San Juan, near Paramillos.

Notes.—Holmberg placed this species under the SUBGENUS PHYCELLA (*Lindl.*). It would be desirable to check the points concerning the slight union of the spathe-valves at the base, and the presence or absence of bracts. If the spathe is tubular below, and bracts are not always present, this species should be restored to the Genus *Habranthus*.

2. A. GRANATIFLORA (Holmb.) Traub & Uphof, comb. nov.; *Hippeastrum granatiflorum* Holmberg in Anal. Mus. Nac. Buenos Aires, 1903, pp. 79-80.

Description.—Bulb ovate, $3\frac{1}{4}$ to $3\frac{1}{2}$ cm. in diameter, tunics black or brownish black, neck $3\frac{1}{2}$ cm. long, $\frac{3}{4}$ to 1 cm. in diameter; leaves bright green, linear, about $2\frac{1}{2}$ mm. wide; scape 25 cm. long, a little compressed, pale green, glaucous, slightly tinged with pink at the base; spathe valves 42 mm. long; pedicels from 21 mm. to 63 mm. long; perianth funnel-shaped, tinged with scarlet or pomegranate red, moderately zygomorphic; petaloid segments 47 mm. and sepaloid segments 45 mm. long; filaments to 30 mm. long, red to carmine above the base; anthers $2\frac{1}{2}$ mm. long, $1\frac{1}{4}$ mm. wide, pollen orange-yellow; style 35 mm. long, stigma colored violet, obscurely tri-lobed.

Habitat.—Uruguay, Maldonado.

3. A. BONARIENSIS (O. Kuntze) Traub & Uphof, comb. nov.; *Hippeastrum Bonariense* O. Kuntze in Revis. gen. plant., III, pp. 310-311.

Description.—The leaves not contemporaneous with the flowers; lower segments extended horizontally, the upper ascending; flower purple, about $\frac{1}{2}$ cm. wide; flowers declinate; pedicels more than 8 cm. long.

Habitat.—Argentina; Buenos Aires.

Notes.—The descriptions of O. Kuntze are lacking in important particulars, and it is necessary to consult the original material before the species are finally placed.

4. *A. GAYANA* (O. Kuntze) Traub & Uphof, comb. nov.; *Hippeastrum gayanum* O. Kuntze in Revis. gen. plant. III, pp. 310-311.

Description.—Lower segments or all segments bent back; segments pointed, tube constricted; flowers more or less erect, purple; style exerted.

Habitat.—Argentina.

Notes.—The description is lacking in important particulars.

5. *A. HERBERTIANA* (Lindl.) Traub & Uphof, comb. nov.; *Phycella Herbertiana* (Lindl.) in Bot. Reg. t. 1341; *Rhodophiala andina* Philippi; *Hippeastrum andina* Baker; *H. Herbertianum* Baker in Jour. Bot. 1878, 83. (See *Herbertia* Vol. 1).

6. *A. ELWESII* (C. W. Wright) Traub & Uphof, comb. nov.; *Hippeastrum Elwesii* C. W. Wright in Kew Bull. 1914: 330. 1914.

Description.—Leaves linear, contemporary with the flowers, 26 cm. long, 5 mm. wide; peduncle cylindric, 6 mm. in diameter, two-flowered; spathe valves two, 6 mm. long, 8 mm. wide; pedicels about 4 cm. long; perianth exterior clear yellow, interior blood-red, tube funnel-shaped, 1 cm. long, 6 mm. in diameter at the base, with short scales above the insertion of the filaments; segments elliptic, narrow, 4 cm. long, 1.8 cm. wide; stamens a little shorter than the perianth, style twice the length of the stamens; stigma trifid, lobes short.

Habitat.—Argentina; Rio Limay, near Lake Nahuel-Huapi.

Notes.—The perianth segments of this species are uniformly yellow on the exterior, and those of *A. ananuca* are yellow with a red midrib. Described by Wright from a plant which flowered in Sept. 1903, and again in July 1914, at Colesborne, England, from bulbs introduced from Argentina by H. J. Elwes.

7. *A. BICOLOR* R. & P.; *A. cyrtanthoides* Sims in Bot. Mag. t. 2399; *A. ignea* Lindl. in Bot. Reg. t. 809; *Phycella ignea*, *Crytanthoides*, *Magnifica*, *graciliflora*, *attenuata*, *brevituba*, *vicolor*, and *biflora* Herb. in bot. Reg. t. 1943; *P. angustifolia* Philippi; *Hippeastrum bicolor* Baker in Jour. Bot. 1878, 83 (See *Herbertia* Vol. 1.)

8. *A. PHYCELLOIDES* (Herb.) Traub & Uphof, comb. nov.; *Habranthus phycelloides* Herb. in Bot. Reg. t. 1417; *Hippeastrum phycelloides* Baker in Jour. Bot. 1878, 83. (See *Herbertia* Vol. 1.)

SUBGENUS 2. CHILANTHE* (*Traub & Uphof*)

9. *A. JAMESONII* (Baker) Traub & Uphof, comb. nov.; *Hippeastrum Jamesoni* Baker in Jour. Bot. 1878, 83. (See *Herbertia* Vol. 1.)

10. *A. BERTEROANA* (Baker) Traub & Uphof, comb. nov.; *Hippeastrum Berteroanum* Baker in Jour. Bot. 1878, 83; *H. Berteroanum* Philippi. (See *Herbertia* Vol. 1.)

11. *A. BAGNOLDII* (Herb.) Traub & Uphof, comb. nov.; *Habranthus Bagnoldi* Herb. in Bot. Reg. t. 1396; *Hippeastrum Bagnoldi* Baker in Jour. Bot. 1878, 83. (See *Herbertia* Vol. 1.)

*Since the Genus *Habranthus* has been revived, the Subgenus *Habranthus* is no longer appropriate. The name *Chilante* is proposed in honor of the Chilean Republic where most of linear-leaved *Amaryllis* are native.

12. *A. BIFIDA* (Herb.) Traub & Uphof, comb. nov.; *Habranthus bifidus* Herb. in Bot. Mag. t. 2599; *Hippeastrum bifidum* Baker in Jour. Bot. 1878, 83. (See Herbertia Vol. 1.)

13. *A. ADVENA* Gawl. in Bot. Reg. t. 849; bot. Mag. t. 1125; *Hippeastrum advenum* Herb. App. 31; *Habranthus hesperius* Herb.; *H. mendocinus* Philippi; *Eustephia Macleanica* Baker in Ref. Bot. t. 322, non Herb.; *Chlidanthus cumingii* Presl. (See Herbertia Vol. 1.)

14. *A. PULCHRA* (Herb.) Traub & Uphof, comb. nov.; *Habranthus pulcher* Herb. in Amaryll. 161, t. 26, f. 1; Roem. Amaryll. 96; Kunth. Enumer. Plant. v. p. 495, n. 10; *Hippeastrum pulchrum* Holmberg in Anal. Mus. Nac. Buenos Aires, 1905, XII, p. 145.

Description.—Scape 9 cm. long; spathe valves $5\frac{3}{4}$ cm. long; pedicels unequal, 2 to $8\frac{1}{4}$ cm. long; 5-flowered; ovary large, perianth 3 cm. long, stamens and style shorter than the perianth; stigma trifid.

Habitat.—Argentina; Buenos Aires.

15. *A. MARGINATA* (R. E. Fr.) Traub & Uphof, comb. nov.; *Hippeastrum marginatum* R. E. Fr. in Nova Reg. Sci. Upsal. MCMV-MCMVII, t. IX.

Description.—Bulb spherical, 6 cm. in diameter, neck 5 cm. long, tunics brown; leaves linear, 2 dm. long, 4 to 6 mm. wide, with microscopic hyaline teeth on the edges; scape round, about 2 dm. long, 2 to 3 mm. wide; spathe-valves red, about 9 cm. long, somewhat united at the base, bracts 6 cm. long, white and red; umbel about 10-flowered, 4 to 6 cm. long; ovary 8 mm. long; perianth-tube 3 to 3.5 cm. long, 1.5 mm. wide at base, and broadened to 3 mm. at the top; perianth-limb funnel-shaped, segments 5 to 6 mm. wide, the three exterior ones about 15 to 20 mm. long, the outer ones somewhat shorter; stamens attached at the throat of the perianth tube, free from each other, three 10 to 11 mm. long, the other three 6 to 8 mm. long, flattened at the base, and membranous, toward the top, filiform; anthers long, yellow and shorter than the perianth; style filiform, as long as the perianth; stigma trifid, lobes 1 to 2 mm. long.

Habitat.—Argentina, Province of Jujuy, Santa Catalina, El Angosto, in sandy soils, elevation 3600 meters.

Notes.—The local name for this species is "Campanilla" according to Fr. Claren. The description was apparently made from a specimen (11559) collected by Kurtz, Febr. 1, 1901. Fr. Claren claims that this species may be related to *Amaryllis soratensis* Baker, but the union of the spathe-valves at the base might indicate that it belongs with *Habranthus*.

16. *A. LINEATA* (Philippi) Traub & Uphof, comb. nov.; *Habranthus lineatus* Philippi; *Hippeastrum lineatum* Baker in Jour. Bot. 1878, 82. (See Herbertia Vol. 1.)

17. *A. ROSEA* (Herb.) Traub & Uphof, comb. nov.; *Habranthus roseus* Herb.; Sweet in Brit. Flow. Gard. ser. 2, t. 107; *Hippeastrum pumilus* Lodd. Bot. Cab. t. 1771; *H. roseum* Baker in Jour. Bot. 1878, 82; *Zephyranthes purpurea* Philippi. (See Herbertia Vol. 1.)

18. *A. CHILENSIS* R. & P.; *Habranthus chilensis* Herb. Amaryll.; *Hippeastrum chilense*, Baker in Jour. Bot. 1878, 82. (See Herbertia Vol. 1.)

19. *A. SORATENSIS* (Baker) Traub & Uphof, comb. nov.; *Hippeastrum soratense* Baker Amaryll. p. 42. (See *Herbertia* Vol. 1.)

20. *A. ANDICOLA* Poeppig; *Habranthus andicola* Herb.; Kunth. Enum. v., p. 500; *Hippeastrum andicolum* Poeppig in Jour. Bot. 16; 82. 1878; *Zephyranthes andicola* Baker Amaryll. 1888.

Description.—Leaves linear, glaucous; peduncle 6-7 in. long; spathe bifid, reaching half-way up the flower; perianth-limb bright violet, 2 in. long; tube $\frac{1}{4}$ to $\frac{1}{3}$ in. long; stamens very short, deflexed.

Habitat.—Chile; Andes of Antuco; flowers in January.

SUBGENUS 3. RHODOPHIALA (*Baker*)

21. *A. MONTANA* (Philippi) Traub & Uphof, comb. nov.; *Habranthus montanus* Philippi; *Hippeastrum montanum* Baker in Jour. Bot. 1878, 83.

22. *A. PRATENSIS* (Herb.) Traub & Uphof, comb. nov.; *Habranthus pratensis* Herb.; Bot. Reg. 1842, t. 35; *Rhodophiala amarylloides* Presl.; *Placea pratensis* Poepp.; *Stephanoma elegans* Kuntze; *Habranthus speciosus* Herb.; *Hippeastrum pratensis* Baker in Jour. Bot. 1878, 84.

23. *A. UNIFLORA* (Baker) Traub & Uphof, comb. nov.; *Rhodophiala montanum* Philippi; *Hippeastrum uniflorum* Baker in Jour. Bot. 1878, 83. (See *Herbertia* Vol. 1.)

24. *A. RHODOLIRION* (Baker) Traub & Uphof, comb. nov.; *Rhodolirion andium* Philippi; *Hippeastrum Rhodolirion* Baker in Jour. Bot. 1878, 84. (See *Herbertia* Vol. 1.)

25. *A. MODESTA* (Philippi) Traub & Uphof, comb. nov.; *Rhodophiala modesta* Philippi; *Hippeastrum modestum* Baker in Jour. Bot. 1878, 83. (See *Herbertia* Vol. 1.)

SUBGENUS 4. MACROPODASTUM (BAKER)

26. *A. SOLANDRIFLORA* (Herb.) Traub & Uphof, comb. nov.; *Hippeastrum solandriflorum* Herb. App. 31; Bot. Mag. t. 3771; var. *chlorolecum* Lindl. Coll. Bot. t. 11. (See *Herbertia* Vol. 1.)

27. *A. CANDIDA* (Stapf) Traub & Uphof, comb. nov.; *H. candidum* Stapf in Bot. Mag. CLIII (1927), t. 9184.

Description.—Bulb globose, 7.5 cm. in diameter, with black-purple tunics. Leaves appearing after flowering, up to 7, strap-shaped, long tapering downwards, subacute, flatly channelled, up to over 30 cm. by 2-2.5 cm. where widest, somewhat glaucous. Scape 70 cm. high, 2-5 cm. thick at the base, dark-purple at the base, glaucous upwards. Umbel of 6 slightly sweet-scented flowers, supported by 2 lanceolate bracts, which are up to 6 cm. long and soon dry up, turning reddish, pedicels 4 cm. long. Receptacle $1\frac{1}{2}$ cm. long. Perianth zygomorphous, more or less pendulous, in the mature bud about 20 cm. long; tube slender, 9-10 cm. long, at the middle 4-5 mm. wide, greenish, loosely funnel-shaped, with the upper halves of the segments separated laterally, the lowermost rather distant from its neighbours, outer segments oblanceolate with recurved tips and crisped margins, 9-12 cm. by 2 cm., pure

white except the base, which is slightly suffused with green, inner segments very similar, 1.5-1.6 cm. wide. Stamens inserted about 7.5 cm. above the base, the outer 7 cm., the inner 8 cm. long; anthers almost 2 cm. long before dehiscing, golden yellow. Style 16-18 cm. long; stigma 3-fid. whitish 2 mm. long.

Habitat.—Province of Tucuman, Argentine.

Notes.—Introduced by Maj. A. Pam in 1925 from Tucuman, Argentine and first described by O. Stapf in Curtis' Botanical Magazine (l.c.), 1927. *A. candida* differs from *A. solandriflora* by "its more graceful, somewhat shorter flowers, their narrower, exquisitely crisped segments and their color, which, apart from the greenish tube, is a pure white. In shape and size of the perianth it closely resembles *A. viridiflora*, which is, however, described as having green flowers. It also seems to have a relatively longer tube and perianth-segments with rather flat margins."

28. *A. TUCUMANA* (Holmberg) Traub & Uphof, comb. nov.; *Hippeastrum Tucumanum* Holmberg in Anal. Mus. Nac. Buenos Aires (1905), p. 153.

Description.—Bulb almost spherical, 6 cm. long, 7 cm. in diameter, with dark tunics; neck short, 3 cm. long; roots numerous, up to 5 mm. in diameter; leaves elongated, grooved, less at the lower end, 38 to 50 cm. long, 2½ cm. wide at the base, 4¾ cm at the middle, terminating in an obtuse apex; scape green, 40 to 50 cm. high, umbel many-flowered; perianth white, almost the size and form of *Hippeastrum ambigum* Herb. (var. *Tweediana*); stigma trifid.

Habitat.—Argentina, Tucuman, Salta.

Notes.—Holmberg states that he saw it in flower October 28, 1904, at Sur de Salta.

29. *A. viridiflora* (Rusby) Traub & Uphof, comb. nov.; *Hippeastrum viridiflorum* Rusby in Bull. N. Y. Bot. Gard. 6: 491-1910.

Description.—Bulb, leaves and fruit not seen, otherwise glabrous, about 6 dm. high; scape stout; bracts of spathe 2, distinct, 5-6 cm. long, nearly 2 cm. broad, acuminate, purple at the base; pedicels 3, about 7 cm. long, erect, the flowers slightly declined; ovary obovoid, about 1 cm. long, 4 mm. broad; flowers about 20 cm. long, 10 cm. broad, green; perianth at summit of ovary about two-thirds as broad as the latter, very gradually enlarging upward to the throat; perianth divided about two-fifths of the way to the base, the lobes oblanceolate, mucronate, about 3 cm. broad; filaments inserted at about the middle of the tube, moderately unequal, the longer nearly equaling the perianth, much thickened below, attenuate above; anthers 5-6 mm. long, oblong, attached at the middle of the back; style filiform, about equaling the stamens, nearly uniform throughout; stigma broader than long, of three rounded lobes.

Habitat.—Tropical rain forest, elevation of 3500 ft., eastern foot of Bolivian Andes.

Notes.—Collected by R. S. Williams, near Machichoriza, Bolivia, in 1902.

30. *A. HAYWARDII* Traub & Uphof, nom. nov.; *Hippeastrum soratense* Rusby (non Baker) in Bull. N. Y. Bot. Gard. 4: 319. 1907.

Description.—Bulb unknown; leaves minutely puberulent under lens, 3-4 dm. long, 2-3 cm. broad, linear, or a little broader above the middle, obtuse at the tip, strongly about 30-nerved, the nerves dark; scape very stout, 2-3 dm. long; spathe valves 4-5 cm. long, lanceolate, 1.25 to 1.5 cm. broad at the base; pedicels about 6 cm. long, strongly curved; ovary about 1 cm. long, 5 mm. broad, oblong; perianth nearly 1 dm. long, tube funnel-shaped, about 4 cm. long, 1 cm. broad at the summit, the base very slender; stamens and style about equalling the perianth, the anthers 6-7 mm. long; style obscurely trilobed, 1 mm. broad.

Habitat.—Bolivia.

Notes.—Rusby originally identified No. 1624 of the Bang collection as *H. Mandoni* Baker, but later described it as a new species as *H. soratense*, the name of an earlier valid species described by Baker. *H. soratense* Rusby non Baker is therefore an invalid name. The species has been renamed for Mr. Wyndham Hayward, the energetic Secretary of the American Amaryllis Society, who has done much toward the advancement of the amaryllids.

SUBGENUS 5. LAIS (SALISB.)

31. *A. CANTERAI* (Arech.) Traub & Uphof, comb. nov.; *Hippeastrum Canterai* Arechavaleta in Acad. Mus. Nac. Montevideo. 2:285-286, 1901.

Description.—Bulb ovoid, 8 to 10 cm. long, 3 to 5 cm. wide, tunics membranous, dark reddish; leaves lorate, 40 to 50 cm. long, 2½ to 3 cm. wide; flowers in November; scape one meter or more in length, robust; spathe-valves about 4 cm. long, lanceolate, pointed at the tip, membranous, veined, light reddish at the base; bracts filiform; pedicels erect, 3 to 4 cm. long; perianth about 10 cm. long, red-carmine, drooping; perianth segments unequal, (narrowing toward the middle to 4 to 6 mm. in width, and gradually widening to an oblong shape in the apex); stamens uneven, much longer than the perianth, red in color, anthers linear-oblong, violet; style red, much longer than the stamens; stigma *trifid*, lobes spatulate, 2 mm. long.

Habitat.—Uruguay, Department of Rivera, Region of Tanqueras, in low humid land, in lagunes and shores near Cuchilla Negra.

Notes.—Named for C. B. Cantera, enthusiastic propagator of ornamental plants of Uruguay.

32. *A. BREVIFLORA* (Herb.) Traub & Uphof, comb. nov.; *Hippeastrum breviflorum* Herb. Amaryll. 137, t. 21, fig. 4; Bot. Mag. t. 3549. (See *Herbertia* Vol. 1.)

33. *A. IGUAPENSIS* (R. Wagner) Traub & Uphof, comb. nov.; *Hippeastrum iguapense* R. Wagner in Wiener Illus. Garten-Zeitng (1903) xxviii, t.

Description.—*Bulb* small, egg-shaped; *leaves* dark green, 150 to 200 mm. long, approximately 60 mm. wide, with somewhat rounded tips, and petiolate at the base. *Scape* about 9* inches high, with two to

*The text states "spanne" which translates as "span," the distance between the ends of the thumb and little finger when extended to fullest length.

three drooping flowers; *Perianth* small, segments white, the three upper with lilac and reddish stripes. *Style* almost equalling the segments; *filaments* shorter than the segments; stigma trifid.

Habitat.—Tropical south Brazil; the type material was collected at Iguape on the edge of the primeval forest in sandy, alluvial soil.

Notes.—Discovered by the Botanical Expedition (1901) under the leadership of Dr. v. Wettstein at Iguape, Brazil; bulbs first flowered in March 1902 at Vienna. This is a most graceful and beautiful species, and is distinctly of horticultural value and should be useful in breeding. Belongs to the sub-genus *Lais*, and is near to *Amaryllis breviflora*.

34. *A. VITTATA* Ait.; Bot. Mag. t. 129; *Hippeastrum vittatum* Herb. App. 31; L'Herit. Sert. t. 15; Red. Lil. t. 10; Bury Hexandr. Pl. t. 32 & 40. (See *Herbertia* Vol. 1.)

35. *A. HARRISONII* Lindl. in Bury, Hexandr. Pl. t. 27; *Hippeastrum Arechavaletae* Baker, in Kew Bull. 1898, p. 226; Gard. Chron. 1899, vol. 1. p. 332; *Hippeastrum (Habranthus) Harrisoni* Hooker. in Bot. Mag. cxxvi (1900) t. 7737.

Description.—*Bulb* about two inches in diameter, globose; scales dark brown; neck scarcely any. *Leaves* about six, a foot and a half long by one and a half to two inches broad, linear, but rather narrowed below, tip rounded, bright green above, with narrow, white margins, paler beneath, with a broad, low thickened costa towards the tip. *Scape* two feet high, stout, cylindric, dull glaucous green, three- or four-flowered. *Pedicels* sub-erect, stout, green, an inch to an inch and a half long. *Bracts* two, oblong-lanceolate, membranous, pale brown. *Ovary* short, green. *Perianth* four inches long, narrowly funnel-shaped; tube green; lobes oblong, sub-acute, spreading and recurved, pure white, with irregularly placed broad blood-red streaks below the middle. *Stamens* sub-declinate, much shorter than the perianth; anthers large, a third of an inch long, golden-yellow. *Style* much longer than the stamens, declinate; stigma trifid, linear, recurved.

Habitat.—Uruguay.

Notes.—According to Lindley in Bury, Hexandr. Pl., Mr. Harrison, of Aigburth, near Liverpool, England, imported this species from Peru, but Sir Joseph D. Hooker (i. c.) considered this an error for the material on which he based his description came from Uruguay. The bulbs of the specimens figured by him (l. c.) were received from Prof. Arechavaleta of Montevideo. Baker, in his Handbook, p. 53, reduced this species to the rank of a hybrid of *A. solandriiflora*. Later (Kew Bull. 1898) Baker described a species, *Hippeastrum Arechavaletae*, from Uruguay, but W. Watson pointed out to Sir Joseph D. Hooker the similarity of this species with *A. Harrisoni* Lindl.

36. *A. PETIOLATA* (Pax) Traub & Uphof, comb. nov.; *Hippeastrum petiolatum* Pax in Beitr. z. K. Amaryll., in Engl. bot. Jahrb. xi, iii, p. 321, n. 21 & p. 330; Niederlein, Result. bot. p. 333.

Description.—*Bulb* 3 to 4 cm. in diameter, brown, globose, not produced at the neck; leaves lanceolate, sharp-pointed, almost paper-like, 20 cm. long, 2 to 2½ cm. wide, narrow at the base; scape about the same length as the leaves; flowers in October; umbel 1-2-flowered, perianth 6 to 7 cm. long, with pedicels, 2 to 2½ cm. long, much shorter

than the spathe; perianth-tube short, appendiculate at the throat with minute scales; perianth segments oblong, purple, about 1 to $1\frac{1}{2}$ cm. wide; filaments inserted in the throat, somewhat unequal, shorter than the perianth; anthers variable, linear, 12 mm. long; style filiform; stigma trifid, with straight lobes, 2 mm. long.

Habitat.—Argentina, Corrientes, Santo Tome, and Monte Juste.

Notes.—Holmberg classes it under the Subgenus *Lais* Salisbury.

37. *A. FLAMMIGERA* (Holmb.) Traub & Uphof, comb. nov.; *Hippeastrum flammigerum* Holmberg in Anal. Mus. Nac. Buenos Aires, 1902: 411-412.

Description.—Bulb globose, stoloniferous, 5 cm. in diameter, tunics black-brown, neck short, 1 cm. long; leaves, 3 to 5 in number, 8 to 10 cm. long; sublanceolate, $1\frac{1}{2}$ cm. wide at the base, widening to $2\frac{3}{4}$ cm.; scapes two, seldom three, 12 to 20 cm. long or longer, green but often tinged with red, whitish at the base, 8 mm. in diameter; spathe valves 5 to 6 cm. long, $1\frac{1}{2}$ cm. wide, blood red to red, 2-valved, bracts linear, thread-like; umbel 3 to 4 flowered, seldom 5-flowered, often all but two flowers are abortive; pedicels 2 to $2\frac{1}{2}$ cm. long, $2\frac{1}{2}$ mm. in diameter, obtuse, triangular, erect; perianth, including ovary, 7 cm. long, segments 6 cm. long spatulate-lanceolate, a very little undulate, flowers bright red with purple veins, greenish-yellow in the throat; ovary 8 to 9 mm. long, 4 mm. broad; stamens thread-like, unequal; style somewhat colored, stigma trifid, lobes short, $1\frac{1}{2}$ to 2 mm. long.

Habitat.—Argentina, Misiones; Santa Ana.

38. *A. RUTILA* Gawl. in Bot. Reg. t. 23; *Hippeastrum rutilum* Herb. App. 31; Lodd. Bot. Cab. t. 1449; *Hippeastrum bulbulosum* var. *rutilum* Herb. (See *Herbertia* Vol. 1.)

39. *A. DAMAZIANA* (Beauvard) Traub & Uphof, comb. nov.; *Hippeastrum Damazianum* Beauvard in Bul. L'Herb. Boissier, 6:585-587. 1906, Fig. 3.

Description.—Type specimen in Herbarium Barbey-Boissier. Bulb unknown; leaves lorate-linear, obtuse, 25 to 30 cm. long, 2 to 3 cm. wide; scape compressed, grayish, variegated with purple, 16 to 25 cm. long; spathe-valves lanceolate-obtuse, membranous, pink, spotted with purple, 6 to 7 cm. long, overtopping the pedicels; perianth campanulate, large, 10 to 11 cm. long, bright red, throat greenish, dotted with purple; perianth tube 0.7 to 0.9 cm. long; stamens 9 to 10 cm. long, filaments pink, dotted with purple, anthers 0.7 cm. long; style pink, 11 to 12 cm. long, exserted from the perianth tube, stigma trifid.

Habitat.—Brazil, Minas Geraes, sur les rochers plateau de l'Itaculumi.

Notes.—Specimen collected by L. Damazio, Oct. 1904, No. 1481. Beauvard states that the species differs from *A. rutila* in having the style exserted from the perianth, and in the campanulate shape of the perianth, and longer and wider perianth-segments, and pedicels being shorter than the spathe-valves.

40. *A. ANGUSTIFOLIA* (Pax) Traub & Uphof, comb. nov.; *Hippeastrum angustifolium* Pax in Engl. Bot. Jahrb. vol. 11, p. 321 and 331, 1889; Niederlein in Result. Bot. (Bol. Meusual del Mus. Prod. Agrent. vol. 3, 1890, p. 333.)

Description.—Bulb large with well developed neck, 13 cm. long; leaves glaucous, coriaceous, linear, margined, 1 to 1½ cm. wide; scape, erect, 80 to 100 cm. high, 1 cm. in diameter in the middle and almost ½ cm. below the umbel, which is composed of 6 flowers; spathe with bracts that wither during flowering; flowers very declinate with pedicels 5 cm. long, much longer than the spathe; perianth 7 to 8 cm. long, with a short tube and a fimbriate corona in the throat; perianth segments unequal, narrowly lanceolate, the broadest 1 cm. wide; filaments uneven, the longer nearly as long as the perianth, the shorter inclosed; style filiform, 10 cm. long, much longer than the perianth, and the stamens; stigma trifid with straight lobes, 2 mm. long; ovary 8 mm. long; capsule 3-lobed, 3-parted, 1½ cm. in diameter; seeds aplanate, black, numerous; flowers in October.

Habitat.—Argentina; Misiones, Monte Agudo and San Pedro between Arroyos Leon and Las Islas.

SUBGENUS 6. ASCHAMIA (SALISB.)

41. *A. RETICULATA* L'Herit. in Sert. Angl. 12, t. 14; Bot. Mag. t. 657; *Hippeastrum reticulatum* Herb. in Bot. Mag. sub. t. 2475; Andr. Bot. Rep. t. 179; Red. Lil. t. 424; *Coburgia reticulata* Herb.; *Leopoldia Leopoldia reticulata* Herb. (See *Herbertia* Vol. 1.)

42. *A. BELLADONNA* Linn. in Species Plantarum, 1753; Uphof in *Herbertia* 5, 1938; *A. equestris* Ait.; *Hippeastrum equestre* Herb. App. 31; Jacq. Hort. Schoen. t. 63; Bot. Mag. t. 305; Red. Lil. t. 32; *A. punicea* Lam.; *Hippeastrum occidentale* Roem.; *A. belladonna* Schwartz non Linn. (See *Herbertia* Vol. 1.)

43. *A. REGINAE* Linn.; *Hippeastrum reginae* Herb. App. 31; *H. regium* Herb.; Miller, Ic. t. 24; Bot. Mag. t. 453; Red. Lil. t. 9; Bury, Hexandr. Pl. t. 24. (See *Herbertia* Vol. 1.)

44. *A. CROCIFLORA* (Rusby) Traub & Uphof, comb. nov.; *Hippeastrum crociflorum* Rusby in Bull. N. Y. Bot. Gard. 6: 492. 1910.

Description.—Specimens 3 dm. high. glabrous, the leaves not seen; the scape dilated upwards; bracts of the spathe 2, distinct, oblanceolate, obtuse, 4-5 cm. long, thickish, deep-purple; pedicels 2, slender, 1.5-2 cm. long; ovary 6 mm. long, 4 mm. broad, oblong; perianth tube about 15 mm. long, infundibular, the lobes 5 cm. long, 2 cm. wide, rose-purple; filaments much thickened below, moderately unequal, shorter than the corolla; style about equaling the corolla, the stigma shortly and broadly 3-lobed, the lobes rounded.

Habitat.—Bolivia.

Notes.—Collected by R. S. Williams on the banks of the Guerratuma River, elevation of 3500 ft., in 1902.

45. *A. STYLOSA* Bury Hexandr. Pl. t. 33; *A. maranensis* in Bot. Reg. t. 719; *A. staminea* Seub.; *Hippeastrum stylosum* Herb. in Bot. Mag. t. 2278. (See *Herbertia* Vol. 1.)

46. *A. PROCERA* Duchartre, Flore des Serres t. 2077-8; *Hippeastrum procerum* Lemaire in Ill. Hort. xi, 408; *A. Rayneri* Hook f. in Bot. Mag. t. 5883). (See *Herbertia* Vol. 1.)

47. *A. LEOPOLDII* Moore in Gard. Chron. 1870, 733, fig. 140; *Hippeastrum Leopoldi* Dombrain in Floral Mag. t. 475-6. (See Herbertia Vol. 1.)

48. *A. MANDONII* (Baker) Traub & Uphof, comb. nov.; *Hippeastrum Mandoni* Baker Amaryll. 1888. (See Herbertia Vol. 1.)

49. *A. SCOPULORUM* (Baker) Traub & Uphof, comb. nov.; *Hippeastrum scopulorum* Baker Amaryll. 1888. (See Herbertia Vol. 1.)

50. *A. MINIATA* Ruiz. & Pavon.; *Hippeastrum miniatum* Herb. App. 31. (See Herbertia Vol. 1.)

51. *A. ANDREANA* (Baker) Traub & Uphof, comb. nov.; *Hippeastrum Andreanum* Baker in Gard. Chron. 1880, ii, 424. (See Herbertia Vol. 1.)

52. *A. MUESSERIANA* (L. Linden) Traub & Uphof, comb. nov.; *Hippeastrum Muesserianum* L. Linden in Illus. Hort. 43: 376, t. 72. 1896.

Description.—Scape 2 to 3 flowered, perianth salmon colored, tinted with pink, perianth segments with broad band in center and vittate on sides; stamens and style about the same length and both longer than the perianth.

Habitat.—South Brazil.

Note.—This species was collected by Mr. Muesser and sent to L. Linden in France. The description consists of the mention of the color of the flower and an illustration. The incomplete description is based primarily on the plate in Illus. Hort. 1896. The species is placed here tentatively.

SUBGENUS 7. OMPHALISSA (SALISB.)

53. *A. CALYPTRATA* Gawl. in Bot. Reg. t. 194; *Hippeastrum calyptratum* Herb. App. 31; Lodd. Bot. Cab. t. 864; *A. fulvovirens* Schott.; *A. unguiculata* Morren. (See Herbertia Vol. 1.)

54. *A. PSITTACINA* Gawl. in Bot. Reg. t. 199; *Hippeastrum psittacinum* Herb. App. 31; Lodd. Bot. Cab. t. 1204; Bury, Hexandr. Pl. t. 23. (See Herbertia Vol. 1.)

55. *A. PLATENSIS* (Holmb.) Traub & Uphof, comb. nov.; *Habranthus spathaceus* Herb. in Bot. Mag. 2597; Amaryll. 160 (non Sims, non Roemer); Kunth. Enum. V. p. 494 n. 8.; *Hippeastrum platense* Holmberg in Amaryll. 1905, p. 155-156.

Description.—Tunics of bulb black; leaves narrow, obtuse; scape 2-flowered, tinged with red at the base; spathe valves flesh colored, 6 1/3 cm. long; peduncle 3 3/4 cm. long, tinged with red; ovary purplish, 3 mm. long; perianth tube short, obscured by the corona; perianth segments deep red, 2 1/2 cm. long, about 6 mm. wide, the outer pointed, the inner obtuse; style, stigma and filaments rose colored, whitish at the base, anthers and pollen yellow; style much longer than the filaments and much shorter than the limb; stigma trifid.

Habitat.—Argentina, Buenos Aires.

56. *A. ORGANENSIS* (Hook) Traub & Uphof, comb. nov.; *Amaryllis aulica* var. *glaucophylla* in Bot. Mag. t. 2983; *Hippeastrum organense* in Bot. Mag. sub. t. 3803; *A. Gardneri* Seubert; *A. correiensis* Bury, Hexandr. Pl. t. 9. (See Herbertia Vol. 1.)

57. *A. AULICA* Gawl. in Bot. Mag. t. 3311; *Hippeastrum aulicum* Herb. App. 31; Bury Hexandr. Pl. t. 19; Lindl. in Bot. Reg. t. 444, 1039. (See Herbertia Vol. 1.)

58. *A. PARDINA* Hook f. in Bot. Mag. t. 5645; *Hippeastrum pardinum* Dombroin in Floral Mag. t. 344. (See Herbertia Vol. 1.)

59. *A. FUSCA* (Kraenzl.) Traub & Uphof, comb. nov.; *Hippeastrum fuscum* Kraenzl. in Eng. Bot. Jahrb. 40: 237, 1908.

Description.—Bulb and leaves unknown; leafless during flowering season; scape 30 cm. high, sturdy; spathe valves 2, lanceolate, about 5 cm. long; 2-flowered, horizontal, somewhat drooping, bracts slender, filiform; pedicels 5 cm. long; ovary 1.2 to 1.5 cm. long, 5 mm. broad, perianth 8 cm. long, 2.5 to 3 cm. wide, segments lanceolate, pointed, practically equal, tube lacking; flowers in South-August, rust red dotted with black; stamens as long as the style, 9 to 10 cm.

Habitat.—Peru; found growing under shrubbery between Sandia and Curyocuyo at an elevation of 2500 meters.

Notes.—(Dr. Weberbauer n. 1506). It is very near *A. pardina*, but with *A. fusca*, according to Dr. Weberbauer, the plant is leafless during the flowering season. The perianth never opens more than half, and the segments have a very unusual color and are only half as broad as those of *A. pardina*. Otherwise these two species are quite similar in habit, and in the arrangement and shape of the spots on the segments.

60. *A. CYBISTER* (Herb.) Traub & Uphof, comb. nov.; *Sprekelia Cybister* Herb. in Bot. Reg. 1840, t. 33; Bot. Mag. t. 3872; *Hippeastrum Cybister* Benth. in Gen. Plant. iii. 725; Flore des Serres t. 455-6. (See Herbertia Vol. 1.)

UNCLASSIFIED SPECIES

61. *A. ANANUCA*. (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum ananucaae* Philippi in Anal. Univ. Chile, 1890. *Habitat*.—Chile.

62. *A. PHILIPPIANA* Traub & Uphof, nom. nov.; *Hippeastrum angustifolium* Philippi (non Pax) in Anal. Univ. Chile, 1890. *Habitat*.—Chile.

Notes.—*Hippeastrum angustifolium* Pax was described in 1889, and a year later, in 1890, Philippi proposed another species under the same name. *Hippeastrum angustifolium* Philippi non Pax is an invalid name and the species is unnamed. The name *Amaryllis Philippiana* is here proposed in honor of Philippi who described a large number of *Amaryllis* species.

63. *A. ARAUCANA* (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum araucanum* Philippi, in Anal. Univ. Chile, 1890. *Habitat*.—Chile.

64. *A. BAKERII* (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum Bakeri* Philippi in Anal. Univ. Chile, 1890. *Habitat*.—Chile.

65. *A. COLONIANA* (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum colonum* Philippi in Anal. Univ. Chile, 1890. *Habitat*.—Chile.

66. *A. CONSOBRINIANA* (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum consobrinum* Philippi in Anal. Univ. Chile, 1890. Habitat.—Chile.

67. *A. FORGETII* (Worsley) Traub & Uphof, comb. nov.; *Hippeastrum Forgetii* Worsley. Habitat.—Peru.

68. *A. LAETA* (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum laetum* Philippi in Anal. Univ. Chile, 1890. Habitat.—Chile.

69. *A. MOELLERII* (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum Moelleri* Philippi in Anal. Univ. Chile, 1890. Habitat.—Chile.

70. *A. POPETANA* (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum popetanum* Philippi in Anal. Univ. Chile, 1890. Habitat.—Chile.

71. *A. PURPURATA* (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum purpuratum* Philippi in Anal. Univ. Chile, 1890. Habitat.—Chile.

72. *A. SOLISII* (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum Solisi* Philippi in Anal. Univ. Chile, 1890. Habitat.—Chile.

73. *A. SPLENDENS* (Renj.) Traub & Uphof, comb. nov.; *Hippeastrum splendens* Renjifo in Anal. Univ. Chile, 1884. Habitat.—Chile.

74. *A. TENUIFLORA* (Phil.) Traub & Uphof, comb. nov.; *Hippeastrum tenuiflorum* Philippi in Anal. Univ. Chile, 1890. Habitat.—Chile.

SUBGENUS SEALYANA, GENUS AMARYLLIS (LINN. EX PARTE) UPHOF,
AMARYLLIDACEAE

HAMILTON P. TRAUB, **Florida**

After the preceding article was already set up and major changes could no longer be made, the writer's attention was drawn to the recent researches of Sealy in Curtis's Botanical Magazine, tab. 9504, Oct. 1937, on the subject of *Hippeastrum Blumenavia* (C. Koch et Bouche ex Carr.) Sealy.

Sealy has shown that *Griffinia Blumenavia* C. Koch et Bouche ex Carr., belongs in the Genus formerly known as *Hippeastrum*, but now recognized as *Amaryllis* (Linn. ex parte) Uphof. His work also proves that the species *Amaryllis iguapensis* (R. Wagner) Traub and Uphof, described in the preceding article, is identical with the species just mentioned. The new combination *Amaryllis Blumenavia*¹ is therefore proposed.

Sealy points out that the seeds in *Amaryllis Blumenavia* are few and fleshy, and that in *Amaryllis reticulata* (Subgenus *Aschamia*), the seeds are also few and fleshy and the plant shows an approach to the former. Apparently these two species form a natural group worthy of subgeneric rank, and are related to the other species of *Amaryllis* through *A. breviflora*, and *A. vittata* (Subgenus *Lais*). It may be that when the seed character of *A. breviflora* is known that this too may be similar in this respect to the others.

In recognition of the brilliant researches of Mr. Sealy in the phylogeny of amaryllids, the name *Sealyana*² is proposed for the new subgenus with *Amaryllis Blumenavia* as the type, and with *A. reticulata* as the second species.

Abridged Key to the Subgenera of Amaryllis

- A. Seeds many, compressed Subgenera **Phycella, Chilanthe, Rhodophiala, Macropodastrum, Lais, Aschamia, Omphalissa**
- AA. Seeds few, fleshy Subgenus **Sealyana**
(*Amaryllis Blumenavia*, type; and *A. reticulata*)

¹*Amaryllis Blumenavia* (C. Koch et Bouche ex Carr.), Comb. nov. *Hippeastrum Blumenavia* (C. Koch et Bouche ex Carr.) Sealy in Bot. Mag. t. 9504; *Amaryllis iguapensis* (R. Wagner) Traub & Uphof.

²*Sealyana* Traub, Subgenus nov., (*Amaryllis Blumenavia*, *A. breviflora*) Genus *Amaryllis* (Linn. ex parte) Uphof, *Amaryllidaceae*.

BRUNSVIGIA GIGANTEA (VAN MARUM) COMB. NOV.

In Gardeners' Chronicle (Vol. CIII: 60. 1938), Ernst H. Krelage reports some researches on the nomenclature of the plant which has been known for many years as *Brunsvigia Josephine* (Redouté) Gawl.

“It is well-known that this imposing Amaryllid was dedicated to the French Empress Josephine, Napoleon's first wife. Indeed, it was named in her honour by Redouté, who described and figured the plant under the name of *Amaryllis Josephinae* in the seventh volume of his sumptuous *Les Liliacées* published in 1812.

“He had never seen any description of this new introduction, which had flowered twice in the gardens at Malmaison, the Empress's residence. There was only one bulb of it, imported from Holland.

“Redouté evidently did not know that the plant had been described before by Martinus van Marum, a remarkably many-sided Dutch scientist. Foremost as a natural philosopher, he was also a learned botanist, astronomer and palaeontologist. He was Director of the Physical Institute founded by Teyler at Haarlem in the eighteenth century, and owned an extensive, private garden. His plant collections were very complete and varied; a printed catalogue in French, was issued in 1810. He lived from 1750 to 1837—hence this tribute to his memory.

“Van Marum was in continued contact with the bulb-growers of Haarlem. These had obtained numerous Cape bulbs, imported by a French officer, who in 1789 had returned from the Cape of Good Hope to Holland. The latter planted these bulbs in a garden at Heemstede, near Haarlem, in order to show the flowers to the bulb-growers, who might like to purchase them. Mr. Rosenkrantz, a well-known bulb merchant of that period, who lived near this garden, bought several of the bulbs, including one very large one, which the Frenchman had obtained from a merchant, without ever having seen it in flower. Notwithstanding many serious efforts he had never succeeded in getting more than that one bulb of this kind.

“Not before the year 1805 did the bulb flower for the first time in the Rosenkrantz nursery, where it created a sensation. It was first considered to be the plant which was then called *Amaryllis orientalis*, now known as *Brunsvigia gigantea*.

“Van Marum, however, rightly stated important specific differences from the former and described the new species under the name of *Amaryllis gigantea* in the *Natuurkundige Verhandelingen der Bataafsche Maatschappij der Weetenschappen*, Vol. III, 1, p. 345, (1805), accompanied by a coloured plate in reduced size.

“G. Voorhelm Schneevoegt, a Haarlem bulb and plant grower of European repute, author of the excellent *Icones*



John Martley, Stellenbosch See page 159

Haemanthus species—*H. coccineus*, upper left; *H. Katherinae*, upper right; *H. filiformis*, and *H. Lynesii* (*H. multiflorus* on label), lower left; *H. hirsutus*, lower right.



Leon A. Page, Winter Park, Florida

See pages 28 and 161

Hybrid Crinum—Krelagei

Plate III

Plantarum Rariorum (1793), wrote an article on the new species in the *Allgemeines Deutsches Gartenmagazin*, Vol. III (1806), to which a reproduction of Van Marum's coloured plate was added. He fully recognized the exactness of Van Marum's observations.

"Evidently both these descriptions remained unknown not only to Redouté, but also to Gawler, who published an original coloured plate in the *Botanical Register*, Vol. III (1817), tab. 197-198, from a plant in "Mr. Griffin's collection at South Lambeth, very lately imported by that gentleman from Cape of Good Hope, where it was collected in the district of Hantam."

"Baker, in his *Handbook of the Amaryllideae* (1888) commits the same omission, mentioning Redouté as the original describer of the species.

"Let us return to the only bulb known in Europe before the fresh importation by Griffin.

"The bulb which had flowered in the Rosenkrantz nursery was acquired by the Empress Josephine and planted in the Malmaison Gardens near Paris. Here, according to Redouté, it flowered twice, which must have taken place between the years 1806 and 1813, and it was figured for *Les Liliacées*.

"According to the *Botanical Register*, Messrs. Lee and Kennedy became the possessors of an offset from the plant which flowered at La Malmaison.

"It seems appropriate to honour Martinus van Marum as the original authority of *Brunsvigia Josephinae*—be it under the now synonymous name of *Amaryllis gigantea*-- in the year in which the centenary of his death is being commemorated in several meetings of learned societies in Holland."

Although it is not possible to restore the name *Amaryllis gigantea* van Marum, since *Brunsvigia* is a valid genus, it is proper to use the name proposed by van Marum as the basis of a valid new combination. We therefore propose the following,—

Brunsvigia gigantea (van Marum) Traub com. nov.;
Amaryllis gigantea van Marum in Natur. verh. bat. maat. weeten-
 sch. vol. iii, 1, p. 345, 1805; *Amaryllis Josephinae* Red. Lil.
 t. 370-372. 1812; *A. Josephiniana* Herb.; *A. Griffiniana* Herb.;
Brunsvigia Josephinae Gawl. in Bot. Reg. t. 192-193.

Now that the above new combination has been made it is necessary to find a valid name for the species that has been known up to the present as *Brunsvigia gigantea* Heist. However, it appears that this latter species was named *Amaryllis orientalis* by Linnaeus (See Plate 107), under the assumption that the species was native to the orient, and it will be necessary to carry on additional research before any attempt is made to give it a valid name.

—HAMILTON P. TRAUB.

THE DAYLILY DISPLAY GARDEN AT ROGER WILLIAMS PARK,
PROVIDENCE, R. I.

GEORGE DEWITT KELSO, *Rhode Island*

My interest in *Hemerocallis* began with the gift of a clump of day-lilies in bloom by a neighbor. He did not know the name so we had to hunt it up and found it to be *Hemerocallis flava*, the common Lemon Lily. Then we discovered that we already had the old tawny daylily, *Fulva Eurora*, growing on our place. Later we added Kwanso, the old double form, and this constituted our foundation stock. We had previous to this time made a planting of various lilies, sand pocket and all and not one came up while the daylilies kept right on growing.

We got the idea somewhere of starting a public display garden of daylilies so that one could see them in bloom and decide what was most desirable for ones own garden. Five years ago last January we put this idea up to the R. I. Horticultural Society, and it was favorably received. Our society secretary was also Superintendent of the Park and he offered us land for the planting, and \$10.00 was voted for expenses but never called for. We first asked our members for contributions. Only two besides myself responded with one plant each and one of these was unnamed. Then I tackled the Nurseries and the N. Y. Botanical Garden. The following responded very generously:—Farr Nursery, Lovett Nursery, N. Y. Botanical Garden, Bay State Nursery, and William N. Craig. I aimed for the first season to collect 25 varieties and secured 54. Later contributions have been added with the passing years so that our donors now total 20. All of our plants have been donated.

Notable among the lists are 11 varieties direct from Amos Perry and paid for by Mr. A. Donald Kelso of England, also a nice collection from Mr. B. Y. Morrison. We now have about 125 varieties and expect to add about 25 more during the season of 1938.

With growth of numbers new problems arose. Our first planting was in an unfrequented corner of the Park but with the advent of a new Park Superintendent, it was moved to a very accessible spot with plenty of room for development.

The average gardener would not want more than 3, 5 or at most 10 varieties of daylilies in his garden so we asked some friends to help us select a few varieties for a recommended list and this developed the next year into a general scoring plan and now after two years of this scoring work it seems advisable to have the work directed under better auspices. We have asked Prof. George Graves to continue the job and he has consented. He is well equipped in experience and facilities for he is connected with the Massachusetts State College at its Waltham Field Station as Assistant Research Professor of Nursery Culture.

We aim to score for garden value and the present plan will take from three to five years and then new developments will call for further discrimination so the work will go on indefinitely. Our work will be regional in extent, embracing New England, New York, New Jersey and possibly Pennsylvania and Ohio. Co-operation is invited.

As an aid for the present day I have kept records of first blooming dates under the crude color classifications, yellow, orange, and fulvous and the all yellow night bloomers. These lists will greatly aid one in selecting varieties, particularly as to color and date of bloom. Looking at the flowers in bloom or consulting a non-commercial grower is a safe plan and it is fortunate for all of us that our very best varieties are offered at reasonable prices with a \$3.00 limit.

PRELIMINARY STUDIES ON DAYLILY SCORING
FOR GARDEN VALUE

GEORGE DEWITT KELSO, *Rhode Island*

Editorial Note. The following table has been adapted by the editor from data (1936 and 1937) furnished by Mr. Kelso, and it is apparently the first attempt to rate daylily varieties on a numerical basis. These preliminary studies led to the enlarged project for 1938 conducted by George DeWitt Kelso and George Graves. (See the announcement following this article). Such studies are urgently needed and these gentlemen are to be commended for their pioneer efforts.—*H. P. T.*

		1936	
		Rating	Votes
No.	1. Mikado (Stout) -----	9.4	(7a, 1b)
	2. Hyperion (F. B. Mead) -----	9.4	(7a, 1b)
	3. Ophir (Farr) -----	9.3	(6a, 1b)
	4. Golden Dream (Betscher) -----	9.3	(6a, 1b)
	5. George Yeld (Perry) -----	9.1	(5a, 1b, 1c)
	6. Goldeni, (Betscher) -----	9.0	(4a, 1b, 1c)
	7. Wau-Bun (Stout) -----	8.9	(5a, 3b, 1c)
	8. Cressida (Betscher) -----	8.9	(4a, 2b, 1c)
	9. Radiant (Yeld) -----	8.7	(2a, 2b, 1c)
	10. Soudan (Stout) -----	8.5	(1a, 4b, 1c)

		1937	
		Rating	Votes
No.	1. Bijou (Stout) -----	9.5	(4a)
	2. Mikado (Stout) -----	9.3	(6a, 1b)
	3. Ophir (Farr) -----	9.1	(6a, 1b, 1c)
	4. Pale Moon (Cleveland) -----	8.9	(3a, 1b, 1c)
	5. George Yeld (Perry) -----	8.8	(5a, 2b, 1d)
	6. Cressida (Betscher) -----	8.7	(4a, 2b, 2c)
	7. Wau-Bun (Stout) -----	8.6	(1a, 5b)
	8. Hyperion (Mead) -----	8.6	(5a, 2b, 1d)
	9. Golden Dream (Betscher) -----	8.6	(3a, 2b, 2c)
	10. Mrs. A. H. Austin (Betscher) --	8.6	(4a, 1b, 3c)

Notes by Mr. Kelso.—

1936 covers 91 varieties, 9 persons participating. 1937 covers 163 varieties, 8 persons participating.

Only the ten highest scoring varieties for each year are included and only those varieties receiving 4 or more votes. Goldeni, 8.3, Radiant, 8.2, Soudan, 8.1 failed to place in the 1937 list.

The scale of rating is as follows: *a*, 9-10, *b*, 8-9, *c*, 7-8, *d*, 6-7. In arriving at the numerical ratings, *a* was counted as 9.5, *b* as 8.5, *c* as 7.5 and *d* as 6.5. Below 7 is regarded as a discard.

One can readily see that these ratings are inconclusive for lack of uniformity, few varieties considered and small number participating; yet they show the preferences fairly consistently for the two year period as seven names are in both lists.

DAYLILY COLOR CLASSIFICATION CHART AND DATES OF FIRST BLOOM. SEASON OF 1937

GEORGE DEWITT KELSO, *Providence, R. I.*

The Classification and dates of first bloom were compiled from records at Roger Williams, Park, Providence, R. I.

Looking at these lists what do I see? Evidently a lot of patient work for the flowers were inspected mornings, late afternoon and often at 10 p. m. Look sharp and you will notice that the four lists are quite alike in the number of varieties:—yellow, 33, orange 29, fulvous 24, and night bloomers 21, a total of 107.

Now the night bloomers are all yellow and these added to the day yellow list makes 54, which is one over one half the list. Remember also that the night bloomers are also in open flower during the next day of their opening and you will see that yellow predominates at the present time.

1937 CLASSIFICATION CHART AND DATES OF FIRST BLOOM

YELLOW			ORANGE		
<i>Flava</i>	May 25	<i>Olif</i>	June 1		
<i>Gracilis</i>	May 28	<i>Dr. Regel</i>	June 2		
		<i>Sieboldi</i>	June 2		
<i>Minor</i>	June 3	<i>Tangerine</i>	June 2		
<i>Nocerensis</i>	June 4	<i>Ajax</i>	June 3		
<i>Burbank</i>	June 22	<i>Middendorffii</i>	June 4		
<i>Miranda</i>	June 22	<i>Orangeman</i>	June 5		
<i>The Gem</i>	June 25	<i>Flamid</i>	June 6		
<i>D. D. Wyman</i>	June 26	<i>Gold Dust</i>	June 6		
<i>Pollyanna</i>	June 26	<i>Dover</i>	June 9		
<i>Modesty</i>	June 28	<i>May Queen</i>	June 18		
<i>Royal</i>	June 29	<i>Queen Mary</i>	June 22		
		<i>Radiant</i>	June 22		
<i>Florham</i>	July 1	<i>Mehami</i>	June 24		
<i>Lemon King</i>	July 1	<i>Vesta</i>	June 26		
<i>Thunbergii</i>	July 1	<i>Lovett Orange</i>	June 27		

<i>Mrs. A. H. Austin</i>	July 4	<i>Sirius</i>	June 28
<i>Soudan</i>	July 5	<i>Amaryllis</i>	June 29
<i>J. R. Mann</i>	July 8		
<i>Wau-Bun</i>	July 8	<i>Goldeni</i>	July 4
<i>J. A. Crawford</i>	July 10	<i>Iris Perry</i>	July 5
<i>Lemon Queen</i>	July 10	<i>Harvest Moon</i>	July 6
<i>Estmere</i>	July 12	<i>Midas</i>	July 8
<i>Hyperion</i>	July 12	<i>Mrs. W. H. Wyman</i>	July 8
<i>Ophir</i>	July 12	<i>Bay State</i>	July 13
<i>Sir M. Foster</i>	July 12	<i>Cressida</i>	July 14
<i>Anna Betscher</i>	July 13	<i>Gypsy</i>	July 18
<i>Mrs. Perry</i>	July 13	<i>Golden Dream</i>	July 26
<i>Royal</i>	July 13	<i>Multiflora</i>	July 29
<i>Shirley</i>	July 13		
<i>Luteola grandiflora</i>	July 14		
<i>Luteola pallens</i>	July 18		
<i>Luteola major</i>	July 16		
<i>Curlypate</i>	July 26		
<i>Chrysolora</i>	July 29		
<i>Dorothy McDade,</i>	Late Sept.Oct.		

FULVOUS

<i>Mikado</i>	June 22
<i>Fulva Europa</i>	June 26
<i>Fulva Maculata</i>	June 28
<i>Bagdad</i>	July 2
<i>Gladys Perry</i>	July 8
<i>Bardeley</i>	July 10
<i>Aurantiaca</i>	July 11
<i>Fulva (Chinese)</i>	July 12
<i>Cinnabar</i>	July 14
<i>Imperator</i>	July 14
<i>Margaret Perry</i>	July 14
<i>Flora pleno</i>	July 15
<i>Kwanso</i>	July 15
<i>Sunset</i>	July 16
<i>George Yeld</i>	July 17
<i>Kwanso</i>	July 18
<i>Viscountess Byng</i>	July 19
<i>Fulva Cypriana</i>	July 21
<i>Mary Stoker</i>	July 22
<i>May Sadlier</i>	July 22
<i>Cissie Guiseppe</i>	July 24
<i>Sunkist</i>	July 24
<i>Fulva (Japanese)</i>	July 27
<i>Fulva rosea</i>	July 29

NIGHT BLOOMERS

<i>Luteola</i>	July 2
<i>Lemona</i>	July 5
<i>Calypso</i>	July 7
<i>Parthenope</i>	July 7
<i>Sovereign</i>	July 8
<i>Golconda</i>	July 9
<i>Gold Standard</i>	July 9
<i>Citronella</i>	July 11
<i>Mandarin</i>	July 11
<i>Flava major</i>	July 12
<i>Lovett Lemon</i>	July 12
<i>Pale Moon</i>	July 13
<i>Yellow Hammer</i>	July 13
<i>Thelma Perry</i>	July 16
<i>Woodlot Gold</i>	July 19
<i>Baroni</i>	July 20
<i>Gold Imperial (Perry)</i>	July 21
<i>Gold Imperial</i>	July 21
<i>Citrina</i>	July 22
<i>Sunny West</i>	July 23
<i>Ochroleuca</i>	July 26

Our yellow list starts with *Hemerocallis flava* which was described and named by Linnaeus and that places it among the venerated flowers of many generations back and in its class is not excelled by any of the modern upstarts.

Look again at these lists. Only two, both yellow, bloomed in May. In June we had 9 yellows, 18 oranges, and 3 fulvous. July is the banner month with 21 yellows, 11 oranges, 21 fulvous and 21 night bloomers. From some of these July bloomers the season extended well into the end of August. *Dorothy McDade*, a beautiful yellow, smiled at us in mid-September and some stalks were cut in October just before frost and opened up nicely in the house.

Warning. These dates are only tentative. Much of this data was from newly set or reset plants and with different weather conditions during the season of 1938 may show variations but they do give one a picture of the comparative blooming periods.

I have a predeliction for the fulvous list. Here is a class that is undergoing rapid development and in a few years will require subdivisions. This list will include varieties with stripes and spots, zones and eyes, bi-colors, pinks, browns, very dark shades, pastel shades—a bewildering variety.

Don't wait for these new creations. Get some of the best in the market today and enjoy them. When you look at a list of 100 varieties, and have room for only ten or a dozen, what are you going to do about it? If you have room for ten plants set them 3 feet apart to allow for mature development and defer the day of resetting. Finally let me suggest this modest list,—*Flava*, *Ophir*, *Goldeni*, *Gypsy*, *Mikado*, *Kwanso*, *George Yeld*, *Fulva rosea*, *Calypso* and *Pale Moon*.

ANNOUNCEMENT—1938 EVALUATION OF DAYLILIES FOR GARDEN VALUE

Under date of May 12, we have received a circular letter from Prof. George Graves, Assistant Research Professor of Nurseryculture, Massachusetts State College, Field Station, Cedar Hill, Waltham, outlining the plans for the cooperative garden evaluation of named daylilies in the Southeastern climatic region for 1938.

Since the Daylily Committee of the Society has not as yet prepared forms for the evaluation of daylilies on a national basis, it is suggested that those interested, from other climatic regions, write to Prof. Graves for the necessary forms to be filled out and returned to him at the end of the season. The complete results for 1938 should serve as a preliminary valuation of the daylilies now being grown in each of the regions. The results of the preliminary survey will be published in 1939 *Herbertia*.

—*Hamilton P. Traub.*

CLASSIFICATION OF HYBRID AMARYLLIS FLOWER TYPES

Revised for 1938, 1939 and 1940 shows: Hybrid amaryllis shall be subdivided tentatively into the following types on the basis of the characters indicated below,—

FLOWER TYPES

- A. Flowers distinctly drooping, tube long (over 3 inches long)
 - B. Tube very long (over 4 inches) *Solandriflorum Type A*
 - BB. Tube shorter (3 to 4 inches) *Solandriflorum Type B*
- AA. Flowers slightly upright, horizontal or slightly drooping, tube short
 - C. Tube narrow, (1 to 3 inches)
 - D. flower compact, *Reginae Type A*
 - DD. flower pointed, *Reginae Type B*
 - CC. Tube open (to 1 inch)
 - E. flower compact, *Leopoldi Type A*
 - EE. flower pointed, *Leopoldi Type B*

EXHIBITION GROUPS

For exhibition purposes there shall be three major groups, (1) Grandiflora classes in which flower form and size standards are the important considerations; (2) Decorative classes in which the use of the plant—landscape, rock garden, forcing, etc., shall be the important considerations, and (3) Double flowering classes.

CLASSES AND AWARDS (PRIZE SCHEDULE)

At the annual National Amaryllis Show, and at other exhibitions, as voted by the Board of Directors, the Society will award its First Class Certificate for meritorious new and standard varieties; its award of merit; and its first, second, third and fourth prize ribbons, in the classes indicated below. Any money prizes offered shall be authorized by action of the Board of Directors.

Each species or varied exhibit shall consist of one or more potted flowering plants, or one or more flower scapes up to and including 1945; after which date three potted flowering plants or three flower scapes shall be required in each case.

SECTION A. GENUS AMARYLLIS

- Class 1. Single entries of Amaryllis species.
- Class 2. Best collection of botanical species and varieties.
- Class 3. Best collection of 10 or more Grandiflora varieties.
- Class 4. Best collection of 5 to 10 Grandiflora varieties.
- Class 5. Best collection of 10 or more Decorative varieties.
- Class 6. Best collection of 5 to 10 Decorative varieties.
- Class 7. Best hybrid amaryllis floral arrangement.
- Class 8. Best amaryllid floral arrangement.
- Class 9. Best display.

Standard Grandiflora and Decorative Varieties

The *score card*, and *prize schedule* are reproduced on the two following pages.

Classes of Grandiflora, Decorative and Double Varieties (Prize Schedule)
Section A. Genus Amaryllis (continued) Classes 101 to 499, inclusive.

COLOR CLASSIFICATION (Fischer Color Chart)	Grandiflora Group						Decorative Group	Double Group
	Leopoldi Type A	Leopoldi Type B	Reginae Type A	Reginae Type B	Solandri- Horum Type A	Solandri- Horum Type B		
White without markings.....	101	151	201	251	301	351	401	451
White with slight pale red markings.....	102	152	202	252	302	352	402	452
White with lighter red markings.....	103	153	203	253	303	353	403	453
White with lighter red stripes, keels, stars, tips, etc.	104	154	204	254	304	354	404	454
White with red stripes, keels, stars, tips, etc.	105	155	205	255	305	355	405	455
Yellow without markings.....	106	156	206	256	306	356	406	456
Yellow with markings.....	107	157	207	257	307	357	407	457
Bronze without markings.....	108	158	208	258	308	358	408	458
Bronze with slight markings.....	109	159	209	259	309	359	409	459
Bronze with distinct markings.....	110	160	210	260	310	360	410	460
Orange without markings.....	111	161	211	261	311	361	411	461
Orange with slight markings.....	112	162	212	262	312	362	412	462
Orange with distinct markings.....	113	163	213	263	313	363	413	463
Pale red without markings.....	114	164	214	264	314	364	414	464
Pale red with slight markings.....	115	165	215	265	315	365	415	465
Pale red with distinct markings.....	116	166	216	266	316	366	416	466
Lighter red to light red without markings..	117	167	217	267	317	367	417	467
Lighter red to light red with slight markings	118	168	218	268	318	368	418	468
Lighter red to light red with distinct markings	119	169	219	269	319	369	419	469
Red without markings.....	120	170	220	270	320	370	420	470
Red with slight markings.....	121	171	221	271	321	371	421	471
Red with distinct markings.....	122	172	222	272	322	372	422	472
Dark red.....	123	173	223	273	323	373	423	473
Darker red.....	124	174	224	274	324	374	424	474
Violet red.....	125	175	225	275	325	375	425	475
Rainbow and tri-color types, excluding green	126	176	226	276	326	376	426	476
Blue, and lilac.....	127	177	227	277	327	377	427	477
Any other color.....	149	199	249	299	349	399	449	499

Score Card—Grandiflora group¹ Hybrid Amaryllis

All flowers to be expanded in ½ or more direct sunlight.

Color Class No..... Exhibitor's No.....

Flower Type.....

CHARACTER TO BE SCORED	METHOD OF RATING	POSSIBLE SCORE
Color and texture	No flower of inferior color to be considered; the full 50 points to be deducted for major color defects; dark green in combination with medium and dark red is especially objectionable.	50
Form	Rating should be based on conformity to type.	15
Size	Except in the case of Solandriflorum types, the following shall rule (diameter across face): 6" to 7", allow 10 points; 7" to 9", allow 13 points; 9" and above, allow 15 points.	15
Habit	For Solandriflorum types the drooping habit is normal; but for Reginae and Leopoldi types, horizontal and slightly erect carriage are to be favored, although slight drooping is allowable.	5
Number of flowers to scape	For less than 3 or more than 5 allow 2 points; for 3 to 5 allow 5 points.	
Length of scape	The length should be considered in relation to size of flower; scapes too short to too long should be penalized.	5
Character of Scape	Scapes should not be so coarse as to be conspicuous, but should be sturdy enough to hold up flower well.	3
Fragrance	Should not be too faint or too strong	2

¹NOTE: No entry is to receive first prize unless a rating of at least 86 points is merited; second and third prizes may be awarded to entries rating from 76 points up. A Score Card for the Decorative group is in preparation.

SECTION B. AMARYLLIDS (EXCEPT GENUS AMARYLLIS;

SEE SECTION A, ABOVE)

Class 601 Best collection of *HEMEROCALLIS* species (Daylilies).Class 602 Best collection of hybrid *Hemerocallis* varieties.Class 603 Best Display of hybrid *Hemerocallis* varieties.

Class 610 Best Coll., unnamed seedlings.

Class 621 Single entries, hybrids, dwarf (below 1 ft.).

Class 622 Single entries, hybrids, semi-dwarf (1 to 2 ft.).

Class 623 Single entries, hybrids, semi-robust (2 to 3 ft.).

Class 624 Single entries, hybrids, robust (3 to 5 ft.).

Class 625 Single entries, hybrids, giant (over 5 ft.).

Class 651 *HOSTA* (Plantain Lilies)Class 661 *LEUCOCRINUM*Class 671 *HESPEROCALLIS*Class 701 Best collection of *AGAPANTHEAE*Class 702 *Agapanthus*Class 703 *Tulbaghia*Class 751 Best collection of *ALLIEAE*Class 752 *Bloomeria*Class 753 *Muilla*Class 754 *Allium*Class 755 *Nothoscordum*Class 756 *Tristagma*Class 757 *Steinmannia*Class 758 *Brodiaea*Class 759 *Diphalangium*Class 760 *Milla*Class 761 *Androstephium*Class 762 *Behria*Class 763 *Bessera*Class 764 *Leucocoryne*Class 765 *Stropholirion*Class 766 *Brevoortia*Class 801 Best collection of *GILLESIEAE*Class 802 *Erinna*Class 803 *Solaria*Class 804 *Speea*Class 805 *Trichlora*Class 806 *Miersia*Class 807 *Gilliesia*Class 808 *Gethyum*Class 809 *Ancrumia*Class 901 Best collection of *IXIOLIRION* speciesClass 1051 Best collection of *GALANTHEAE*Class 1052 *Galanthus*Class 1053 *Lapiedra*Class 1054 *Leucojum*Class 1101 Best collection of *CALLICOREAE*Class 1102 *Crinum*Class 1103 *Ammocharis*Class 1104 *Callicore*Class 1105 *Brunsvigia*Class 1106 *Nerine*Class 1107 *Stenolirion*Class 1251 Best collection of *CYRTANTHEAE*Class 1252 *Chlidanthus*Class 1253 *Anoiganthus*Class 1254 *Cyrtanthus*Class 1256 *Vallota*Class 1257 *Ungernia*Class 1351 Best collection of *HAEMANTHEAE*Class 1352 *Hessea*Class 1353 *Carpolyza*Class 1354 *Strumaria*Class 1355 *Buphane*Class 1356 *Griffinia*Class 1357 *Clivia*Class 1358 *Haemanthus*Class 1359 *Choananthus*

Class 1401 Best collection of *ZEPHY-RANTHEAE*

- Class 1402 *Argyropsis*
- Class 1403 *Zephyranthes*
- Class 1404 *Cooperia*
- Class 1405 *Haylockia*
- Class 1406 *Crocopsis*

Class 1551 Best collection of *AMARYLLIEAE* (Except Genus *Amaryllis*, for which see above classes 1 to 499)

- Class 1552 *Placea*
- Class 1553 *Sprekelia*

Class 1401 Best collection of *NARCISSEAE*

- Class 1402 *Cryptostephanus*
- Class 1403 *Tapeinanthus*
- Class 1404 Best collection of *Narcissus* species
- Class 1405 Trumpet *Narcissi*
- Class 1406 *Incomparabilis Narcissi*
- Class 1407 *Barrii* (also *Burbridgi*) *Narcissi*

Class 1751 Best collection of *EUCH-ARIDEAE*

- Class 1752 *Hyline*
- Class 1753 *Stenomesson*
- Class 1754 *Pamianthe*
- Class 1755 *Pancratium*
- Class 1756 *Elisena*
- Class 1757 *Ismene*

Class 1801 Best collection of *EUSTEPHIEAE*

- Class 1802 *Urceolina*
- Class 1803 *Hieronymiella*
- Class 1804 *Eustephia*

- Class 1407 *Apodolirion*
- Class 1408 *Sternbergia*
- Class 1409 *Gethyllis*
- Class 1410 *Pyrolirion*
- Class 1411 *Habranthus*

- Class 1554 *Lycoris*
- Class 1555 *Vagaria*

- Class 1608 *Leedsii Narcissi*
- Class 1609 *Triandrus Narcissi*
- Class 1610 *Cyclamineus Narcissi*
- Class 1611 *Jonquilla Narcissi*
- Class 1612 *Tazetta and Tazetta Hybrid Narcissi*
- Class 1613 *Poeticus Narcissi*
- Class 1614 *Double Narcissi*
- Class 1615 *Cleft-corona Narcissi*

- Class 1758 *Hymenocallis*
- Class 1759 *Calostemma*
- Class 1760 *Calliphurria*
- Class 1761 *Eucharis*
- Class 1762 *Stricklandia*
- Class 1763 *Eurycles*
- Class 1764 *Klingia*
- Class 1765 *Leptochiton*

- Class 1805 *Eustephiopsis*
- Class 1806 *Callipsyche*
- Class 1807 *Eucrosia*
- Class 1808 *Phaedranassa*

SECTION C. ALSTROEMERIDS

Class 1901 Best collection of *ALSTROEMERIACEAE*

- Class 1902 *Alstroemeria*
- Class 1903 *Bomarea*

- Class 1904 *Leontochir*
- Class 1905 *Schickendantzia*

Class 2051 *PETERMANNIA*

Class 2101 Best Collection of *PHILE-SIACEAE*

- Class 2102 *Luzuriaga*
- Class 2103 *Philesia*
- Class 2104 *Lapageria*

- Class 2105 *Eustrephus*
- Class 2106 *Elachanthera*
- Class 2107 *Geitonoplesium*
- Class 2108 *Behnia*

REGISTRATION OF NEW VARIETIES

Descriptions of new varieties of hybrid amaryllids, hemerocallids, and alstroemerids for this section must reach the editor not later than June 1 to be included in the current issue of *Herbertia*. This information is published to avoid duplication of names, and to provide a place for the authentic recording of descriptions. Names should be as short as possible—one word is sufficient. It is suggested that in no case should more than two words be used.

HYBRID AMARYLLIS VARIETIES

Introduced by Heaton Bulb Company, Orlando, Fla.

HELEN L. HEATON (No. 1007) ; compact Leopoldi type pure white except violet feathering on upper petals, lower petals pure white. Seedling—U. S. D. A. x Heaton strain. F. F. C.; Best Bloom 1938 Orlando Amaryllis Show.

BRITANNIA (No. 1003) ; very flat light salmon round petals, slight keel to tips, upper petals slight red veins along keel, Lower petals shaded white at throat to pink at tips. General color light salmon. A new color in Amaryllis. F. F. C. 1938 Seedling—U. S. D. A. x Heaton.

AMERICA (No. 1004) ; compact leopoldi type ; slight cream base indefinite white keel, shaded pink, few dark pink veins. Minutely dotted and speckled except for keel. General color golden pink. 1938 seedling—U. S. D. A. x Heaton.

BERENGARIA (No. 924) ; compact leopoldi type, Soft dark pink with large white star. F. F. C. 1936. Seedling—Heaton x Heaton.

GLORIA (No. 1410) ; Reginae type. Lighter violet with darker veining shaded to light pink at tips of petals. F. F. C. 1938. Seedling—*Serapic 11 x. Peace*.

Introduced by Lakemont Gardens, Wyndham Hayward, Prop., Winter Park, Florida.

CELESTINE (No. C54) ; 8 inch flower, four to stem, medium vigorous type, salmon coppery-pink with white keels to within one inch of outer end of petals ; full flaring Leopoldi type.

MARCELLE (No. C154) ; 8 inch flower, deep red self, compact Leopoldi type, semi-rounded petals, throat 100% red ; four blooms to scape, flaring, open petals. Vigorous. Outstanding handsome petal texture. Blue Ribbon and Second best bloom in Leopoldi class at 1938 Regional Amaryllis Show, Orlando, Fla., 1938.

SEMINOLA (No. C156) ; 7 to 8 inch flower, 100% deep to darker red self, wide flaring rounded petals, three flowers to scape, medium vigorous. Outstanding shape and color as well as texture of petals. Medium vigorous.

FLORIDA MAID (No. C172) ; 7 to 8 inch pointed petal flower, Leopoldi type, rose-pink flushed and veined on white. Distinctive, flaring open type of flower. Four blooms to scape. Vigorous.

HYBRID DAYLILY (HEMEROCALLIS) VARIETIES

Introduced by Lakemont Gardens, Wyndham Hayward, Prop., Winter Park, Florida.

CLEO (No. HC170); large spreading petals, 6-7 inches fully expanded, color a light fulvous coppery-rose-pink with bright golden yellow throat and darker eye zones; faint lighter keel; edges of petals slightly wavy and crinkled; medium compact type.

ALGERIA (No. HC102); open type of flower, semi-compact, petals Algerian red, (7-L-5), eye zones dark maroon (7-L-7), throat Florida gold to saffron (10-K-9) Maerz & Paul.

CARMEN (No. HC153); large open flower, petals between Mosque and Nasturtium (4-H-12); eye zones darker maroon, (7-L-7), throat, sunburst, (10-K-9); general effect a warm, rich rosy brown tone.

MRS. H. H. DEWEY (No. HC104); (H. fulva rosea X) tall plant with fulvous red markings on golden yellow base with edging of gold. Petals Canna to Antique red, (4-J-11); throat slightly greenish yellow and Goldenrod Yellow, (10-L-5). No eye zone markings; full open flower, medium size and medium compact.

NUBIANA (No. HC203); medium compact flower, dark chocolate red petals with light yellowish white stripe down center approximately $\frac{1}{8}$ inch wide. Orange throat. Sepals slightly lighter (orange) in tone. Main color of blade darker than Vulcan. Medium size, free flowering.

ANTARES (No. HC186); tall growing plant, large flower, starlite, deep fulvous red, with darker eye zones and yellow throat. Faint lighter keel, and tipping of sepals in yellow shade.

FLORIDA (No. HC110); foliage evergreen; $1\frac{1}{2}$ ft. in height; flower stalk 2 ft. in height; branched from base upward; 16 to 18 flowers to the stock; begins blossoming during last week in April in Florida; flower is of unusual coloring, throat is light Chrome Yellow, 10-L-4; eye-zone, Bois de Rose, 5-J-9; upper part of inner segments is Rose Blush, 5-C-9 with a Light Chrome Yellow stripe in the center; inner slightly more than $1\frac{1}{2}$ " in width and curled back at the tip; outer segments are 1" wide, semi-straight and twisted at the ends, lighter in color than inner segments, diameter across face, $4\frac{3}{4}$ "; perianth $3\frac{1}{2}$ " in length, tube about $\frac{3}{4}$ " long; modestly sweet-scented, and a rapid multiplier.

Introduced by Hamilton P. Traub, Mira Flores, Orlando, Fla.

INDIAN CHIEF (No. 311); foliage evergreen, upright and $2\frac{1}{4}$ " in height; flower stalk branched, 3 ft. high, with 12 to 15 flowers; flower $2\frac{3}{4}$ " long, tube slightly less than 1", individual segments $5\frac{1}{2}$ " long; diameter across face with segments curled back at the tip, 6" to 7", (8" to 10", if segments are uncurled); general aspect of flower is a bright Brazil Red changing to totem Red, 4-J-12, in full Florida sunshine, throat is saffron Yellow, eye-zone Buccaneer Red, 4-L-12, upper portion of inner segments is Brazil Red, 4-K-12, with a stripe of Saffron Yellow in center; outer segments are overlain

with Buccaneer Red and with a very narrow stripe of Saffron Yellow in center; first flowering date early April, and a recurrent bloomer.

GRANADA (No. 312); foliage evergreen, to 1½ ft., high, flower stalk, branched, to 2¾" high, with 12 to 15 flowers, flower length, 2¾", tube less than 1", diameter across face, 5", with inner segments slightly curled back at tip, and outer segments distinctly curled back at tip, giving the flower a distinctly triangular shape in front view; the coloring is very striking,—throat Spanish Yellow, 10-L-7, inner segments between Monterey Red, 5-J-12 and Autumn Glory, 5-K-12, and with a narrow yellow stripe in center; outer segments, Moroccan Red, 5-K-11, bordered with Golden Yellow; first flowering in early April, and a recurrent bloomer.

HAPPINESS (No. 349); semi-robust, scape branched; flowers of medium size, petaline segments of bright coppery-rose with narrow light orange stripe in center; sepaline segments only slightly suffused with coppery-rose; throat bright orange; first flowers in April, but is a recurrent bloomer; can stand full sunlight.

DR. HUGHES (No. 309); semi-robust; growth habit and flower shape of *Soudan*, flower color (vinacious-rufous) similar to *Cinnabar*, but slightly deeper colored.

DR. STOUT (No. 318); very vigorous, leaves evergreen, up to 1½ ft.; scape up to 3½ ft. branched, 25 or more flowers; flower diameter 6 to 7 inches; flower color is a striking combination, throat and ground color, 10-L-9 (near Sunburst), overlain with Moroccan Red, 5-K-11, the eye zone is somewhat darker, and the sepaline segments are of the same color; a rapid multiplier; first flowering date latter part of May, but has several blooming periods in Florida; can stand full sunlight.

GOLDEN GLOW (No. 319); leaves evergreen, up to 1½ ft.; scape up to 2 ft., branched, with 7 to 8 flowers; color a rich Golden Glow; 9-L-6; flower diameter more than 5½ inches; segments crisped in the upper one-third, particularly around the margins; blooming date in Florida, latter part of April.

ELAINE (No. 346); semi-dwarf; segments are a delicate shade of salmon rose, near 10-A-9, eye zone Old Coral, 3-J-19, throat orange very slightly tinged greenish; does best in partial shade; first blooming date latter part of April.

MAUVE ROSE (No. 315); robust; flowering habit of *Bijou*; throat and ground color Apricot Yellow, suffused mauve rose, (near to 7-E-5), a very unusual color combination; first blooming date middle of April, flowers several times during season.

GLORIOSA (No. 314); semi-robust; throat greenish changing to Golden Glow, segments Algerian Red, (5-L-10), eye zone scarcely perceptible; first flowering date early April. The flower, when fully open in afternoon, is reminiscent of the Genus *Gloriosa*, hence the name.

LENA HUGHES (No. 302); semi-robust; salmon rose with delicate eye zone of a little deeper shade; flower medium in size, but segments are broad and slightly curled back giving the flower a full appearance; first flowering date early April.

WEKIWA (No. 328); semi-dwarf; narrow segments somewhat like *Wau-bun*, but of a rich dark velvety red; first flowering date latter part of April.

EOLA (A variety tentatively introduced in 1937, is hereby withdrawn).

VICTORY TAIERHCHWANG (No. 310); semi-robust; scape branched with 20 or more flowers; petaline segments are near to Spanish Wine (Garnet plus), 7-J-6, (with prominent bright orange stripe in center), eye zone is darker Spanish Wine; sepaline segments are slightly lighter; throat bright orange; first flowers in May, but is a recurrent bloomer, and can stand full sunlight.

SAN JUAN (No. 345); robust; scape branched with 23 to 25 flowers; petaline segments India Red, 7-L-6, eye zone slightly darker; sepaline segments slightly lighter; throat dull orange.

CHARLOTTE TRAUB (No. 305); semi-robust, scape branched with many flowers; ground color bright orange; petaline segments with narrow orange stripe in center, overcast with Emberglow; sepaline segments lighter; orange throat; first flowers in April, but is a recurrent bloomer.

Introduced by R. P. Lord and E. L. Lord, Orlando, Florida.

BARBARA LORD; Clear buff-orange background, no shading at center; irregular rosy-bronze eye spot; petals wide and very wavy; 4 in.; scape 2½-3 ft.

CIMARRON; Shape and size of Soudan; color of Cinnabar but slightly more fulvous, thinning out to a wide creamy yellow margin on petals; glowing orange throughout; eye zone slightly darker; scape 4'; foliage evergreen; free bloomer; early mid-season.

COLUMBINE; The 4 in. flower is very full and of firm texture; ground color clear golden yellow, faintly flushed rosy buff at eye zone, merging ground color at tip; petals 1¼ in., largest near tip; sepals ¾ in.; scape stout, erect, 3 ft.; recurrent bloomers; early.

COPPER LUSTRE; 5 in. flower with a vivid orange-yellow throat and midrib; ground color is intense copper with a metallic sheen; petals 1 in. wide, with a garnet eye zone; sepals 5/8 in.; scape erect; 2½ ft.; free and recurrent bloomer; early.

CORALIE; 4½ in. flower; throat bright yellow, petals 1¼ in. wide, deep coral rose, with clear red eye zone; sepals 7/8 in., same shade but unmarked; scape 30 in.; stout, erect, vigorous; recurrent bloomer, early.

GITANA; Full flower, 4-5 in.; lemon yellow throat; petals 1¼ in., coppery rose, with rosy purple eye zone; sepals 7/8 in., flushed coppery rose with golden margin and midrib; scape 3 ft., slender; continuous bloomer; early.

HARLEQUIN; The velvety 4 in. flower is very full; all segments are intense dark red with the golden throat color extending along midrib to the tip; petals 1 in. wide and undulate; sepals 5/8 in.; scape 4 ft., 20 to 30 flowered; very free bloomer; recurrent; early.

HECTOR; Large (over 6 in.) wide open flower; deep golden throat; petals wide, creamy yellow background, with rosy-bronze suffusion, wide golden yellow center stripe, edges only slightly ruffled; sepals orange with a rosy-bronze suffusion; good substance; pronounced fragrance, free bloomer and very showy.

KUBLAI KHAN; An 8 in. flower of exceptionally firm substance; ground color intense orange; petals $1\frac{1}{2}$ in., flushed red-orange at eye zone; sepals $\frac{7}{8}$ in. wide; scape stout; ascending, $2\frac{1}{2}$ to 3 ft.; vigorous and a recurrent bloomer; early.

MOONGLOW; a beautiful and distinct pale creamy yellow, the outer segments of a just sufficiently deeper tone to form a lovely contrast with the wide ruffled inner ones; faintly fragrant.

ROMANY; Flower full, large (7 in.); rich mahogany brown; large maroon eye zone; a most intense daylily with a lustrous sheen; floriferous, continuous bloomer; vigorous; $2\frac{1}{2}$ to 3 ft.

STELLA ROSE; Medium full with a spread of 6 in., segments recurved at tips; throat golden, star-shaped; petals are ruffled, 1 in. wide, clear salmon-rose with a dark-red angular eye zone; sepals are $\frac{5}{8}$ in. wide and slightly darker; scape $2\frac{1}{2}$ to 3 ft., suberect; recurrent bloomers; early.

SUNBEAM; 7 in. flower with a golden throat; glistening sheen; petals $1\frac{1}{2}$ in. wide, intense yellow-orange; sepals $\frac{3}{4}$ in., just slightly darker; scape suberect, 3 ft., very free bloomer.

TURY; Flowers medium sized (4 in.) but numerous. A definite break in Hemerocallis, having a lily-like form and habit of bloom; Wide pale yellow throat; segments broad recurved at the tips, outer third dusted with cinnamon; scape stiff, erect, 3 ft. Exceptionally good garden effect.

VESUVIUS; A very lovely flower of soft ashy pink, eye zone of a darker rose; throat pale yellow; very full, 5 in.; foliage evergreen; mid-season; $3\frac{1}{2}$ to 4 ft.

VICTOR LORD; Another distinct break in daylilies. Rich clear red with no trace of brown or orange, color evenly distributed with no eye zone; throat area very small and pale lemon yellow; petals 2 in. and sepals fully 1 in. wide; flower large (6 in.) and very full; plant vigorous and floriferous (20 to 30 blooms); mid season; $3\frac{1}{2}$ ft.

AMARYLLIS PROCERA—EXTRACT FROM MR. WORSLEY'S LETTER
TO MAJOR PAM: DATED 8-20-38

Dear Major Pam,—

Hippeastrum procerum. Yes, Mr. Hayward's statements are quite correct. Finding that the pollen of garden vars. of **Hippeastrum** failed every time to fertilize **H. procerum**, and thinking that perhaps some failure in cultivation was responsible, I crossed one **procerum** with another and raised seedlings which grew quite well.

This species is difficult to do well with under cultivation. Even at Petropolis (only 2 miles from its habitat) the bulbs die out quickly as its requirements are not met.

In Gard. Chron. of 5-4-29 you will find a Monograph (from my pen) with 4 figures treating of this plant, but I am sorry that I have not a copy I can send you.

(Continued on p. 153.)

4. CYTOLOGY, GENETICS AND BREEDING

CYTOTAXONOMIC NOTES ON THE GENUS HABRANTHUS¹

WALTER S. FLORY,

*Texas Agricultural Experiment Station
A. & M. College of Texas*

The genus *Habranthus* has had a tumultuous history, and at one period suffered the fate of certain of our less powerful nations. First established in 1824 by Herbert, its members were placed in *Hippeastrum* by Baker in 1878. The latter author in 1888 concurred with Bentham and Hooker (1883) in their division of Herbert's *Habranthus* between *Hippeastrum* and *Zephyranthes*. Then for almost a half century this genus was botanically extinct. In 1927 Stapf recognized Herbert's conception of the genera mentioned here as the most rational one. More recently Mr. H. H. Hume (personal correspondence) and Sealy (1937) carried out extensive studies the results of which lend convincing proof to the idea that taxonomically *Habranthus* is deserving of independent, generic, status.

Members of the tribe *Zephyrantheae* have received but slight attention cytologically. The chromosome numbers of only six species seem to have been reported in published form. In addition to one species of *Sternbergia* with which we are not interested here, Yamamoto and Hosono (1931) list *Zephyranthes candida* as having $2n = 36$; Nagao and Takusagawa (1932) give $n = 19$, $2n = 38$ for this form and $2n = 46$ in *Z. carinata*; and *Z. Lindleyana* has $2n = 48$ according to Fernandes (1930). In 1913 Pace gave $n = 12$, $2n = 24$ for *Atamosco texana*. The present writer (1937) reported 6 pairs of somatic chromosomes as being present in *Zephyranthes robusta*. After Mr. Hume called my attention to the fact that *Habranthus* was reinstated as a genus a fuller report on the chromosomes of this form, now listed as *Habranthus robustus*, was made (1938). It may be said here that the large size, small number, and general external morphology of the chromosomes in this latter form would seem to make them favorable subjects for an analytical study of chromosome structure.

The return of *Habranthus* to generic rank removes two of the forms studied cytologically from *Zephyranthes*. *Habranthus robustus*, first named in 1829, after having been successively named *H. robustus* Herbert, *Hippeastrum tubispathum* Baker, and *Zephyranthes robusta* Benth and Hooker, is returned to the original Herbertian appellation. The "Atamosco Lily" or "Copper Lily" which Pace studied was originally named *Zephyranthes texana* by Herbert (1836). A year later Herbert designated it as *Habranthus Andersonii* var. *texanus*. This was changed by Steudel to *H. texanus* in 1840, and in 1897 Greene made the combination *Atamosco texana* (Morton, 1935). This form is again

¹Contribution No. 451 to the Technical Series, Texas Agricultural Experiment Station; approved by the Director, March 18, 1938.

taxonomically referred to as *Habranthus* and for the present *H. texanus* may be as proper a designation for it as any. The limited cytological evidence supports the taxonomic separation of *Habranthus* from *Zephyranthes*. *Habranthus robustus* and *H. texanus* with 6 and 12 pairs of chromosomes respectively would seem to be more closely related to each other than to the *Zephyranthes* species with 18 or 19, 23, and 24 pairs of chromosomes. There are many points in this connection which a more extended cytological knowledge could illuminate.

According to Sealy (1.c) *Habranthus texanus* is the only form of this genus to occur in a wild condition outside of South America. It is very similar to *H. Andersonii*, a native of Uruguay. These facts have led Sealy (following Hume's suggestion) to consider that probably the "Copper Lily" was introduced into Texas from South America by early Spanish missionaries. This whole proposition is very interesting, especially to Texans with an enthusiasm for native amaryllids.

The habitat of this "Copper Lily" is widespread in Texas. It occurs in the East Texas Timber Belt, on the Coastal Prairies, on the Rio Grande Plains, on the Blackland Prairies, and to some extent in the Edwards Plateau (Cory and Parks, 1937). In other words it occurs at numerous places over an area of at least some one hundred and forty or one hundred and fifty thousand square miles, an area equal to one twentieth of that of the continental United States. Such an extended distribution would make it seem somewhat improbable that this is an exotic plant.

On the other hand we might mention several factors which would seem, if not favorable, at least unopposed to the theory that *H. texanus* is an introduction to Texas. In the period from 1690 to 1735 at least 14 missions were founded in Texas (Hildrup, 1914). Sufficient time has elapsed for a rather wide dispersion of the species, provided that material was sent to this state during the early years of the missions. This plant form has been known in Texas for more than a hundred years; Drummond in 1835 collected specimens, apparently native, for shipment to England. This indicates that, if introduced, it was brought in at an early period and so would have had adequate time to spread. Although this species very seldom, in the writer's experience, propagates itself by divisions, it does readily set and copiously produce seed which germinates quickly and well, permitting its rapid distribution. Thus it is possible that some of the Franciscans did introduce this *Habranthus* into Texas; that it was spread to various sections of the state by the friars; that in several regions it became an escape; that it became more widespread, due to natural dispersion, prior to Drummond's visit; and that its range has continued to widen since 1835.

It is not to be gainsaid that while among the available facts some may be construed as favoring the theory there are others, in addition to those already mentioned, which oppose it. It should be noted that the only records available to us list the various Texas missions as having

been founded by Spaniards coming out of Mexico, and also that *H. texanus* is not reported from that country (Morton, 1937). On the surface the two facts of the previous sentence seem to be irreconcilable with the theory advanced in Sealy's paper and appear to deny that this North American *Habranthus* has been introduced, at least in the manner suggested. It is needless to say that further taxonomical, cytological and historical research is necessary before it can be stated without fear of successful contradiction that *Habranthus texanus* is either an indigent or an exotic.

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(Continued from p. 150.)

Having visited its habitat and seen the plants growing there, I am of opinion that it cannot be well grown in earth. It grows on narrow ledges on nearly perpendicular walls of crystalline rock where its roots are bound by some creeping phylodendrons over an inch or so of rock detritus and organic matter.

Although the temperature in winter admits of light ground frosts and the night air temperature at this alt. (about 4,000 ft.) probably falls to 30° F. or rather lower, the accumulated sun heat on the rocky background (right up to the bulbs) probably prevents frost reaching the bulbs. They do not grow in an erect posture, but at an angle of about 45° (135° with the horizon) in full sunlight and in a saturated air in wind swept positions. Hence you will see the difficulty of reproducing such conditions in this country. My bulbs were grown in 8" drain pipes filled with rock, fibre and live moss. In the second year they had established themselves and flowered freely for several years. Their only enemy was wood lice that gnawed the roots unless trapped daily. Unfortunately I had a mining business in Spain which took me from home for some time, and in my absence the gardener neglected the woodlice traps and let the plants get into bad health, from which I failed to recover them. I have none now, nor do I think I could grow them here as facilities are now wanting. It is a completely evergreen species and seems to have defied cultivation everywhere. I shall always treasure the memory of the days when I saw it in its natural habitat.



Leon A. Page, Winter Park, Florida

See pages 161, 163 and 199

Amaryllis procera—blooming size bulb

Plate 112

5. PHYSIOLOGY OF REPRODUCTION

VERNALIZATION AND PHASIC DEVELOPMENT WITH SPECIAL REFERENCE TO AMARYLLIDS

W. M. JAMES, *California*

A preliminary trial of vernalization as elaborated by Lyssenko and others at the Odessa Plant Breeding Institute indicates that it may be used to shorten the period necessary to bring bulbous plants into bloom from seeds.

It is not my intention to describe all the technique of the operation or to discuss in detail the principles involved. However, a brief summary will show why I think the method may be of use to bulb growers. Very detailed information is contained in Bulletins No. 9 and No. 17 of the Imperial Bureau of Plant Genetics in Great Britain.

Briefly, the process of vernalization makes possible the introduction into field cultivation of many plants whose use is limited by the effect of natural geographical and climatic factors.

Lyssenko and his fellow workers assume that there is a very clear distinction between the phenomenon they refer to as growth, namely increase in weight and size of the plant, and the phenomenon they refer to as phasic development or a qualitative change in the nature of the plant. We can easily understand their use of the term "growth" because there is visual evidence of it all around us. The term "phasic development" is not quite so easy to understand.

These Russian scientists have proved experimentally that certain qualitative changes which they call "phasic developments" must take place in the plant before it can reproduce itself sexually. These changes can be independent of the size and age of the plant, and the plant may enter the reproductive cycle without continuing to grow, and vice versa, it may grow and not make the qualitative change leading to reproduction. Environment affects this process and if the external conditions are favorable both for growth and phasic development, the plant will grow and at the same time pass the stages preparatory to sexual reproduction.

The change that takes place during phasic development is not visible, but nevertheless is very definite. The progress of the plant toward seed development is the only outward indication that the change has taken place.

Probably the most important part of Lyssenko's work was to indicate that these qualitative changes which he and his co-workers call phasic development can take place in the seed in which the embryo has just commenced development, but has not broken the seed coat. Thus, we see that the process of preparation of a plant towards sexual reproduction may occur in the embryo and may be separated in time from the growth of the plant. This makes possible the practical application of the method of vernalization.

We may wonder just how this method may be useful to us. I think one example will indicate its importance. Some of the best kinds of wheat grown in the United States are called winter wheats because the seeds are sown in the fall and the seedlings make little growth during the fall and early winter. Phasic development continues to take place and is more or less completed while growth is practically suspended during the coldest part of the winter. In the spring, growth starts in again and the plant flowers and produces seed. In parts of Russia winter wheat can not be planted in the fall because of climatic conditions. When it is planted in the spring, environmental conditions prevent phasic development and the plants very seldom set seeds. When vernalized seeds are planted in the spring, sexual reproduction takes place in due course and a normal crop of grain is produced.

The process of vernalization consists of germinating seeds to the point where the embryos are ready to pierce the seed coat and then holding the seeds for a time at a temperature low enough to suspend growth. Phasic development takes place during the time growth is suspended.

Lyssenko's work was all done with annuals, so I had no guide at all as to how much treatment seeds of bulbous plants would require. Late in the summer I vernalized some seeds of *Leucocoryne ixioides odorata* and planted them about the middle of September. At the same time I planted my main crop of *Leucocoryne* seeds. Growth of plants from vernalized seeds appeared to be the same as that of plants from untreated seeds. In about two months the tops of the plants from treated seeds died normally. Examination underground showed that the little bulbs had made the same growth that ordinarily would have taken six or seven months.

Next season I intend to vernalize some seeds for a longer period. Ordinarily *Leucocoryne* requires three seasons growth to flower from seed. By fertilization I have reduced that period to two seasons and I am in hopes that proper vernalization will make it possible to secure flowers of this bulbous plant in one year from time of planting seeds.

VEGETATIVE PROPAGATION OF CLIVIAS

I. W. HEATON, *Florida*

In 1936 Herbertia I described a method of propagating Clivias by bud destruction. While this method is much faster than the normal natural increase, it does not meet all requirements of a commercial grower. Last spring another method was tried and found much more satisfactory.

Just prior to the growing period Clivia plants make quite a few new roots. When these new roots are three to four inches long, they are carefully removed from the stem with a tiny piece of the stem attached. A sharp, pointed, narrow knife is needed for this operation, and care must be taken not to damage the root by rough handling. The average

(Continued on page 205.)

6. AMARYLLID CULTURE

REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.

VALLOTAS IN GERMANY

F. MEYER, *Hamburg, Germany*

Vallotas prove nowhere hardy in this country, and, therefore, are always handled as pot plants in cool greenhouses. They are met with occasionally in some provincial nurseries, but are by no means esteemed as favorites by market gardeners, for their flowering season lasts only a short time, and it comes mostly during the late summer months, when the public demand for pot plants is not very great.

However, Vallotas are observed in the windows of sitting rooms or porches in country and city homes (Plate 109). Most plants favored for homes, like Cyclamens, Begonias, etc., are only short-lived, suffering soon from the much too dry air; and only a few species are able to withstand successfully for long such uncongenial conditions. Three amaryllids fall in the latter class,—*Clivia miniata*, *Haemanthus albiflos*, and *Vallota purpurea*.

If grown from seeds, the culture of Vallotas needs some years for the seedling to reach the flowering stage, and in addition the seedlings seem to be more or less variable not so much in color as in size of the flowers. Desirable varieties are propagated only by offsets and they flower mostly in the second year after potting up (Plate 109).

Suitable air conditions for Vallotas are easily secured, and failures are therefore mostly due to unfit soils. The soils should always incline to the heavy and acid side, a little less so while the bulbs are young. They require repeated repotting. In soils too light or containing too much lime they dwindle away. Mature bulbs should be potted up in a mixture of alluvial clay, fibrous peat, a little leaf-mould, river sand, and rubbed old, dry cow manure. Neutral or even alkaline sand as well as loam should be avoided. The reaction of the soil solution should not exceed very much a pH value of 6.0.

Immature bulbs may be planted a little below the surface and should be held during the warm summer months in cold frames. They should be repotted as soon as the pot-bound condition is reached, always without disturbing the fleshy roots. Mature bulbs are planted partly raised above the soil level.

The pots should be chosen as small as possible. Ample drainage is necessary, and particularly needed, when the plants are shifted into their final pots, where they may rest for years, as long as they prove healthy. After becoming pot-bound, they respond well during summer growth, if supplied with weak liquid manures. I always prefer complete ones, but with the proportion of the nitrogenous constituents reduced, and well balanced with regard to acid and alkaline ions, and without any injurious "filler" compounds.

If, after years, repotting of old plants is needed, it may be done advantageously soon after the flowering period. Propagation is successfully carried out by dividing old clumps in early spring.

Curiously enough, the growth responses of pot grown plants are quite different from those observed in their natural home. It is reported by different authors, lastly again by Miss Sarah V. Coombs (South African Plants for American Gardens, p. 80), that in the wilds the leaves die down soon after flowering time. But pot grown plants are to all intents and purposes evergreen.

From spring to the end of flowering time they need bright light, fresh air, and plenty of water. After this they should be watered sparingly and during the winter months they should be given no more water than is necessary to keep the plants sturdy. During the period of partial rest, they will receive sufficient light if placed in a window looking out to the east or west.

Recently our famous nurseryman, *Herr* George Arends, Wuppertal—Ronsdorf, Germany, the well-known originator of many fine strains of Primulas, Astilbes, Saxifragas, Rhododendrons etc., tried to improve Vallotas by means of cross-pollinating different strains and varieties. His own, large flowering type, perhaps *var. major*, pollinated with its own pollen, proved fully self-sterile, because all plants belonged probably to the same self-sterile clone.

Herr Arends then procured bulbs from different sources; among them some from Dutch nurseries. Several strains produced flowers from very small bulbs, but the foliage died down partly soon afterwards. To all appearances these were recent importations, or, in any case, represented forms still very near the wild species of South Africa.

After cross-pollinating several different types, the progeny proved highly variable with reference to size and shape of flowers, but less so in color. However, the color differences were distinct enough to make possible the selection of fine dark reds and others distinguished by a lovely rosy salmon shade. The most striking hybrids will be used in further breeding work.

The old hybrid *Vallota purpurea* x *Cyrtanthus sanguineus* (Hort. Bull.), is apparently nowhere available in Germany, but this report apparently suggested to *Herr* Arends the idea of continuing breeding work in this direction. Success in this direction would increase both color range and the durability of Vallotas, and, furthermore, would combine their more robust constitution with the gracious habit of *Cyrtanthus*. With this in mind, all available *Cyrtanthus* species of the trade were procured,—*C. obliquus*, *C. angustifolius*, *C. lutescens*, and *C. Mackenii*. The most sought after species, *Cyrtanthus sanguineus*, was not available in continental nurseries.

All attempts at crossing the last three small-flowered species with Vallota seedlings failed in both directions, and only with *Cyrtanthus obliquus* did *Herr* Arends succeed after encountering many difficulties and disappointments.

Now the seedlings from the annual crosses are growing to the flowering stage, and the first blooms are expected next year, in 1939.

HAEMANTHUS CULTURE IN SOUTH AFRICA

JOHN MARTLEY, *Banhoek, Stellenbosch, South Africa*

It is only recently that I have taken up the cultivation of our native South African bulbs. This is a large field and full of very great interest. It is only within the last year or so that I have been able to start on the curious but attractive genus of *Haemanthus*.

This is one of the larger genera of the Amaryllidaceae native to South Africa for there are thirty-four species listed in Herbertia 1936. With the exception of our local species *H. coccineus* I have only had time so far to secure a few bulbs of about six of these, and two species from Kenya both of which were mentioned in Herbertia 1935.

Haemanthus coccineus (Plate 110, upper left) is common in Western Cape Province and is found in a great variety of soils—sandy to gravelly with a greater or lesser admixture of clay. The flowers appear in February and March like clumsy red paint brushes poking their heads up out of the ground. By April the brushes have become rather untidy heads of pinkish-red berries, each berry with one to three large seeds. The two leaves appear about this time. In the open these are pressed close to the ground but when grown among other vegetation, the leaves of this species are longer and narrower and partially upright. The photograph (Plate 110, upper left) shows three flower heads in gravelly soil among large stones on the upper mountain slopes at Banhoek near Stellenbosch. Early in January a veld fire had swept over the ground burning up all the vegetation, and when this photograph was taken in February these red paint brushes were very striking objects.

Haemanthus hirsutus has a bulb very like *H. coccineus* and two leaves similarly closely pressed to the ground. It is a smaller and daintier species than *H. coccineus* and the surface of the leaves is covered with coarse hairs. Last year I secured three bulbs of this species from Barkly West and the photograph (Plate 110, lower right) was taken recently of one of the bulbs which flowered. The flower head is quite dainty with pure white flowers and golden tips to the spreading stamens. At the present moment I have the prospect of a nice harvest of seeds from this flower head from which I can increase my stock.

The third photograph (Plate 110, upper right) is of *Haemanthus Katherinae*, a species which comes from Natal. Instead of there being only two leaves as in the two species described above there is a definite stem with up to a dozen large leaves. Another difference is that the flowers appear with the leaves. The overall height is about eighteen inches. The flowers are large and daintily spaced and of the same beautiful sunset pink as the Inanda Lily, *Cyrtanthus sanguineus*.

The fourth photograph (Plate 110, lower left) is of two species from Kenya, *Haemanthus filiformis* and *H. Lynesii*. In both species the bulb and the leaf characters are the same as in *H. Katherinae*. The bulbs were obtained in December and were potted at once. The photograph was taken at the end of February. This shows that the leaf and the flower appear more or less at the same time. The inflorescence of *H. Lynesii* is a handsome bright red spherical mass, about 6 inches in

diameter, formed of red perianth segments and red, gold-tipped stamens. In due course I will have the name of this species confirmed as I have had another *Haemanthus* described to me under this name which is evidently a different species and of which I am hoping to secure a few bulbs for comparison.¹

Haemanthus filiformis (Plate 110, lower left) is a comparatively small species but with the same sort of open inflorescence as in *H. Katherinae*, but the coloring is not nearly so distinctive. There is an interesting point about *H. filiformis* that should be worth while investigating. In the species of *Haemanthus* with which I am familiar the flower head is a simple umbel. In *H. filiformis* the outer pedicels are two-flowered and there is an interesting graduating between these and the inner one-flowered pedicels. The outer flowers have a perianth in five parts and the stamens range from six to five due to a varying amount of connation between two stamens on the side of the second flower. On the inner pedicels the flower is normal and hexamerous as is generally the case in Amaryllidaceae. Examining the series of pedicels from the centre to the periphery, it looks as if the second flower had arisen in the axil of one of the perianth segments of what otherwise would have been a normal solitary flower. This perianth segment becomes thus the subtending bract of the second flower. When fully developed the second flower has four perianth segments, four stamens, and what would appear to be a normal style and ovary. In the hope of harvesting seeds later I did not sacrifice the flower in the cause of science.

I had hoped to obtain a photograph of *Haemanthus Pumilio* before publication. It occurs in the Western Province in flat sandy ground that in wet weather, in winter, is at times water-logged. The flower appears before the leaves towards the end of March and resembles a small dull pink paint brush. Several leaves appear shortly afterwards which are very similar to those of *Nerine sarniensis* but much shorter. The bulb is small but not unlike that of *H. coccineus*.

It is a simple matter to raise *Haemanthus* from seeds. These start to germinate soon after ripening and should be sown not later than two, or at most, three months after harvesting. Seeds that have considerably advanced in germination will grow satisfactorily when planted but of course the sooner they are sown the better. In *Haemanthus coccineus* and *H. hirsutus* the seed leaf soon appears. Next season there is still only one leaf and it is not until the third or fourth season that the full number of two leaves make their appearance. The bulbs of these species take about five or six seasons to reach the flowering stage from time of seed planting. The seeds of the other species I have handled (*H. Katherinae*, *H. magnificus*, *H. natalensis*) behave somewhat differently. The first germination is under the ground with the formation of a small bulb to which the food material in the catyledon is transferred. Then follows a longer or shorter rest period and it is not until six months or more from the preliminary germination that the first leaf appears above ground.

March 12, 1938.

¹The plant had been labeled *H. multiflorus*, but it turned out to be *H. Lynesii*, and this name is used in the text.—Ed.

CRINUM KRELAGEI

WYNDHAM HAYWARD, *Florida*

The variety of hybrid Crinum, known as *C. Powellii Krelagei*, is one of the outstanding hybrid Crinums in the trade today, and is a tribute to the work of the great Krelage firm in Holland, which made such important contributions to the breeding of amaryllids over the period of a century.

The illustration of this Crinum (Plate 111) appearing in this issue of *Herbertia* shows the distinctive character or shape of the flowers, but utterly fails to exhibit the delicate tone of the pink coloration which is one of the variety's main charms. The umbel is frequently larger in good specimens. The writer has grown bulbs of the variety *Krelagei* for four years, receiving them from Holland. It is not quite as vigorous as the American variety Cecil Houdyshel, and is a lighter shade of pink.

The shape of the individual flowers in the umbel is very distinct—a little flaring edge makes the blooms one of the most "open" of the *Powellii* group. The flowers remain in good condition throughout the day in full sun, as a rule, which is unusual in Crinums. The bulbs multiply well, and grow vigorously in rich well drained soil. They can be multiplied rapidly by vegetative means. A strong, established bulb will produce five or six scapes of bloom in one season.

In Florida the flowering season starts with the first warm weather of early spring, in late February or March, and continues through April into May. The foliage of the plant is typically *Powellii* in character. The plant is evidently a selection from a number of seedlings of the *C. longifolium*-*C. Moorei* cross.

AMARYLLIS PROCERA

FRANK VASKU, *Florida*

Through the kindness of a friend we now have a dozen blooming size *Amaryllis procera* bulbs in Florida. They are odd, queer looking bulbs, more like giant crinums than amaryllis in appearance (See Plate 112). Having just received the bulbs the latter part of March of this year, I can do little else than pass on the information that the exporter has given me about their native habitat.

He writes:—"They grow in soil which lies on top of rocks. The soil is very light formed of decomposed leaves and is black, because several times the vegetation, on the mountain where they grow, was burned. They grow *in full sun* amongst weeds which are about the height of the bulbs, there are no trees near, and there is *always plenty of wind*. Perhaps the most important fact is the situation of the plant,—you will never find them on a flat land, but always on slanting ground, the side of a mountain, which is the reason for the bulb being curved and not straight." He goes on to say that they stand below freezing weather in winter and up to 35 degrees centigrade (95 degrees F.) in the shade in summer; and that there are long periods of drought

followed by constant rains. Humidity is always high, so much so that during the driest weather "everything is wet as if it had been raining" every morning.

There are a number of items of great interest in the paragraph above. They grow in full sun, amongst tall weeds, on sloping ground, with plenty of wind. By considering these facts we can probably understand the ecology of the plant better and thus appreciate the factors that have moulded its form, size, and character through countless generations. This *Amaryllis* species is hardy withstanding both long seasons of drought and periods of drenching rains; the heat of tropic summer sun and the below freezing weather of winter. Will it be able to adapt itself to our Florida conditions? They grow in full sun and wind among the weeds, but how much do these weeds protect and shade them? They are never found on level ground. Is this because they must grow on slopes, or is it that only here are found the soil conditions and protection from animals necessary for its well being? We shall endeavor to answer these and other questions as we work with this interesting new-comer to our garden.

AMARYLLIS PROCERA—ITS ECOLOGY AND SOME DEDUCTIONS REGARDING CULTURE, AND BREEDING POSSIBILITIES

CECIL HOUDYSHEL, *California*

Amaryllis procera, popularly called the "Blue Amaryllis" and "Empress of Brazil," does not seem to be offered in the American trade (Plate 112). It is described in Bailey's Cyclopedia of Horticulture which seems to indicate that it may have been formerly available.

Two factors conspire to make this species almost unknown outside its native Brazil. First, the difficulty and expense incurred in importing them. They cannot be dispatched in the mail from Brazil. There is an embarkation fee, a fee for consular invoice and the expense for boxing and packing above the cost of the bulbs. The second factor is the report that the bulbs bloom only the first year after importation.

Probably no one has propagated this species vegetatively and only a few have raised seedlings of it. Most of those who have had the imported bulbs apparently have not found them amenable to either garden or greenhouse culture. We have personally written to a great many growers and find no one who offers a suggestion as to the right culture.

There may be plants that cannot be grown outside their native habitat, but they must be few indeed. No such species is in memory now but certainly some must have offered almost insurmountable difficulties. Study and experimentation have usually shown a successful method. Sometimes the difficulty has been a simple and apparently unimportant factor.

In attempting to cultivate a new species, the ecology of the plant in nature is the proper index for cultural methods. After long inquiry we succeeded in getting into contact with a collector in Brazil who could give a most intelligent report regarding the natural conditions under which *Amaryllis procera* grows.

At Petropolis, near Rio de Janeiro, in south latitude 23° , is a mountain on whose steep slopes this species grows in profusion. No bulbs are found growing on the level lands. Here very strong winds prevail. In the winter there is occasional frost and the temperature at night sometimes falls to 28 degrees F, (-2 degrees C). The days are warm in the sun but decidedly cool in the shade. In the summer the day temperature rises to about 92 degrees F, (33 degrees C.) in the shade.

The rainfall is quite different from southern California in amount and distribution. In the winter, there is little or no rain, but on cool mornings the dew drops from trees and plants like a shower, wetting the ground beneath. There is sometimes a period of three months without rain. Summer rain is abundant. Rain may continue for three weeks, pouring down or drizzling at intervals, the sun never showing. The atmosphere is so humid that boots kept in a closet for two weeks will be covered with mildew. Our correspondent keeps his cigars against the chimney to keep them dry.

The mountains at Petropolis although steep are apparently never very high or rugged but are well worn down and rounded. "Very old," geologists would say. The mountain, where the bulbs are collected has been burned over many times and the soil is therefore black and composed of humus from leaves and charred bits of weeds. Probably because of the moisture the combustion is not very complete and much charcoal enters into the soil composition. The soil is underlaid by solid rock at a depth of only 10 to 20 inches, (25 to 50 cm). Probably the soil is fairly acid although the effect of the ash left from burning over might modify that. The rapidity with which soluble compounds are leached out by the heavy rainfall may make it a factor of no great importance.

No trees grow on the mountain, and only such plants survive that can withstand burning over. *Amaryllis procera* grows in full sun among weeds of about its own height, which is 3 or 4 feet (Plate 112). It is autumn flowering. The plant society in which it is found includes, besides the unknown weeds, bromeliads and a certain grass which burns very easily.

The soil for this species apparently should be composed of nearly pure humus with some leaves and bits of sticks only partly reduced by decay. To this should be added a liberal amount of granular charcoal including the powder. The drainage must be perfect, such as that afforded by a steeply sloping terrace or an elevated bed and underlain a foot below the surface with a thick layer of rocks. If rocks are flat let them be tipped not horizontal.

Since they like strong winds they would likely require perfect ventilation in a greenhouse. Circulation of the air by means of an electric fan might even be advisable.

The species will no doubt require that it be kept nearly dry through the winter. The nature of the soil required and the climate of south Brazil points to the necessity of almost daily watering during the summer. Danger lurks in this practice. Potted bulbs might not thrive under this regime because of imperfect drainage. Probably large bottomless pots set on coarse gravel would be best.

Amaryllis lovers would of course like to have a "blue" amaryllis. Our correspondent states that his father years ago shipped many of the bulbs to Europe but because they bloomed only the first year they ship very few now. There would be a good demand for this species and for improved hybrids of it if it were not too difficult to manage. Assuming that this is a possible attainment three steps are suggested to that end.

First,—to work out cultural methods that will sufficiently resemble natural conditions to maintain and flower the imported bulbs at least for a time.

Second,—to grow many selfed seedlings for the purpose of developing a more amenable type. Vegetatively reproduced bulbs will never do it, but it might be possible with multitudes of seedlings. Nature has done it frequently. So has man. When climatic changes have occurred in a region, some plants have been gradually modified by natural selection and have survived. Seedlings of any species vary in visible characters and probably at least as much or even more in characters which relate to their capacity or lack of capacity to survive under any particular soil and climatic conditions. If this is true then possibly, if many thousands of seedlings were grown, even in the first generation, one or several plants might be found that would be much better fitted to our methods of culture and our climate. In succeeding generations some worth while results could surely be expected. The breeder's handicap here is that he does not have Nature's opulence in resources to bring the desired change. Nature produces millions of seedlings and has aeons of time to accomplish a result. But Nature cannot think nor can it plan for a desired end. Intelligent man with limited means, but with a purpose in view can imitate nature's method and may produce results more rapidly. The procedure then is to grow seedlings in the greatest number possible discarding all but the thriftiest the first year. Possibly only a few of the selected plants could be brought to maturity and those only by the exercise of great skill. Succeeding generations by a similar rigid selection would surely bring a strain of *Amaryllis procera* amenable to culture. Such things have been done and that is why we can grow corn in Minnesota and even in Manitoba.

Third,—to produce hybrid strains of "blue" amaryllis by breeding methods. I will not elaborate on this. By crossing, characters are combined in the first generation, and segregation is secured in the second generation. Even a better "blue" flower might result and certainly hybrids of easier culture. It would probably be better to cross with the lightest colored hybrids in order to avoid the dominance of red as a color character in the seedlings. A species, *Amaryllis iguapensis*, white with red or lilac stripes, described from South Brazil, might be useful in crossing, if it is obtainable.



Leon P. Page, Winter Park, Florida

See page 167

Amaryllis aurica var. stenopetala

Plate 113



Leon L. Page, Winter Park, Florida

See page 167

Allium neapolitanum

Plate 114

AMARYLLIS AULICA VAR. STENOPETATA

WYNDHAM HAYWARD, *Florida*

This species of *Amaryllis* (formerly *Hippeastrum*) is one of the few known in cultivation today, and is one of the most interesting and worth while for several reasons.

It is of moderately easy culture, thriving in pots in any good *Amaryllis* soil, and will grow fairly well under lath shade in Florida when planted in ordinary sandy loam soil, and kept weeded and fertilized. It appears to like very good drainage, like some other *Amaryllis* species.

Its most significant feature is its fall to winter blooming habit. It is of great value to hybridizers on this account. In Florida the bulbs will bloom under good culture any time from late November until Christmas. There may be two spikes to the bulb, each with usually two large, upward-turned flowers of an attractive bright crimson, with rather narrow segments. Contrary to what might be expected, the appearance of the bloom is quite impressive, and it appears at a time of year when a cheerful colored flowering plant is very welcome.

The plant illustrated (Plate 113) is *Amaryllis aulica* var. *stenopetata* and it was received from a firm in Holland, where this species is still fairly common in the trade. It is very rare in the United States. Efforts to set seed on *A. aulica* have so far been fruitless, but the pollen should have very promising results when applied on out-of-season blooms of the spring-flowering types of hybrids. The bulbs of *A. aulica* propagate fairly rapidly by offsets.

ALLIUM NEAPOLITANUM

WYNDHAM HAYWARD, *Florida*

Allium neapolitanum, Cyr., (Plate 114) is a highly decorative and easily managed member of the ornamental onion tribe which is well worth growing in pots or in the open border in good soil. In warm climates the bulbs will bloom in February or March. It is said to need protection if grown outdoors in the north. It is also reported to be used for cut flowers abroad and in California. It is probably the most popular species of *Allium*.

A. neapolitanum forces easily, and produces showy umbels of white flowers on slender, wiry stems. The bulbs are quite inexpensive, a few cents each or less in quantity. Any good soil seems to suit them, although they should have good feeding if they are to be used another year. The leaves are somewhat narrow and spreading, and loose-lying in the pots, adding a graceful touch to the blooming plant. What is perhaps most important of all, there is no perceptible onion smell in this allium. The plants may grow to a foot or more tall, but mostly smaller. In Florida and similar climates it is recommended that the bulbs be planted in the Fall. They multiply by offsets and can be raised from seed.

NARCISSI IN FLORIDA

WYNDHAM HAYWARD, *Florida*

One season's trial planting has been sufficient to prove that gardeners in the sub-tropics need not limit themselves to growing Polyanthus or Tazetta narcissi as is commonly the case.

An experimental planting of some three dozen varieties of Narcissus, including many types, at Lakemont Gardens Winter Park, Florida, during the winter of 1937-38, (an especially dry one and somewhat unfavorable in regard to cool weather) revealed a number of types and varieties which are worth trying in any part of the world which may be South of the cooler part of the temperate zone and just above the tropics. (Winter Park lies between the 28th. and 29th. parallel of North Latitude.)

By the sub-tropics is generally understood that part of the world which is suitable for the culture of the citrus fruits to the best advantage. In Florida, South of Jacksonville, narcissi are rare in gardens with the exception of the Tazetta varieties, *Grand Monarque*, *Paper White*, *Grand Soleil d'Or*, *Chinese Sacred Lily*, etc. These Polyanthus varieties are cultivated by the acre in North Florida and do quite well in gardens over the lower Southern states generally.

Late in 1937 the writer obtained a carefully labeled collection of narcissi from Mr. Cecil Houdyshel, Laverne, Calif., and made a test planting of them in medium rich soil, on a moist but well drained lake-side. The only preparation given before planting the bulbs was the application of some hydrated lime, as the soil was known to be somewhat acid.

The bulbs began to bloom in February, in the following order: First, a small dainty un-named variety of *Narcissus odorus* (Jonquil hybrid) of the Campernelle type. Mr. Houdyshel wrote that he obtained it from southern Georgia, where it is common in old gardens. It bloomed vigorously and freely, with a good root system and foliage,—estimated as 90% of optimum.

Second, *Tresserve* (Yellow Trumpet type) was estimated at 75% of optimum. The slightly smaller size of the bloom may have been due to the small size of the bulb.

Third, *Narcissus odorus*, variety *Orange Queen* was very attractive and effective,—estimated as 90% of optimum.

Fourth, *Narcissus odorus*, Campernelle type, variety *Giganteum*, was also showy and effective,—estimated as 90% of optimum. Vigorous and free blooming.

Fifth, *Narcissus Incomparabilis*, variety *Homespun* was very pretty and charming,—estimated as 80% of optimum.

Sixth, Trumpet Narcissus, *King Alfred*, gave satisfactory blooms, but these were smaller than expected,—probably 75% of optimum.

Seventh, *Narcissus Incomparabilis*, variety *Sir Watkin* was as good as King Alfred in blooming results,—estimated as 75% of optimum.

Eighth, *W. P. Milner* (listed as a White Trumpet Narcissus, but bloomed a light lemon yellow) gave small, poor bloom,—about 50% of optimum.

All of these varieties bloomed by March 7, 1938, the date of writing; and the satisfactory nature of the results may be judged from the fact that practically all of the flowers were pulled and sold in mixed bouquets in the writer's cut flower business as fast as they appeared. A number of the varieties failed to bloom by the date mentioned, and a later report may be required to cover their performances. However, the names of the varieties unsuccessful up to the present, are not given, since the one planting described in these notes is of course not adequate to justify the final rejection of any variety.

Nevertheless the results so far point to the fact that the species, and their hybrids, from Southern Europe, seem quite suited for sub-tropical planting. Whether they will maintain themselves from year to year and increase will be determined in the course of time. Also some at least, of the *Narcissus Incomparabilis* and the Trumpet Daffodils, will "force" sufficiently well in a warm winter climate to repay the garden lover for planting them.

GROWING AMARYLLIS IN POTS

I. W. HEATON, *Florida*

For years the main question has been,—“Why don't my amaryllis flower?” It seems that every amateur has another formula for this, and therefore much misinformation is disseminated to the general public. Amaryllis are naturally hard to kill and if a few simple rules are followed will flower every year, even though grown under very adverse conditions,—dry air and steam heat, and little sunlight.

First; purchase your bulbs early and pot early for late potted bulbs will be blind the next spring and may require two seasons to restore natural vigor. Any good soil with drainage with pH above 6 but below 7.8 will suit amaryllis. During the first two months until leaf growth has started, water sparingly. Feed good plant food during the growing season.

Second; after the bulb has flowered and the danger of frost is past, plunge the pots in a partly shaded location, until early fall. If early flowers are desired the bulbs can be placed in the root cellar for a few weeks' drying off, before starting to water and feed prior to the next flowering period. Never permit the bulbs to become too dry, as this treatment will result in loss of the roots. With proper storage conditions the bulbs may be left dormant until the flower scape appears in the spring, before being brought to the light. Do not over water. Each year after flowering some of the top soil in the pots may be removed and replaced, but do not repot each year, rather every three or four years.

HYBRID AMARYLLIS CULTURE IN POTS

WYNDHAM HAYWARD, *Florida*

There are perhaps few plants more generally grown and admired and about which less is understood than the hybrid amaryllis. The amaryllis, is a tropical plant, and will not stand freezing, and must therefore be largely grown in pots in the North, although it will endure winters in the open ground as far up the Atlantic coast as North Carolina in protected places.

The bulbs are occasionally handled in northern gardens under "gladiolus culture," but this is not generally very satisfactory. The ordinary "instinct" of the amaryllis is to bloom in the early spring, February to April, before outside weather conditions in that area are suitable for planting the bulbs outdoors, and the bulbs do not give their best blooming results unless they are established in soil, or are potbound.

Simplicity is the keynote of the amaryllis bulb's requirements, and many thousands of amateur and professional gardeners with no particular gift or skill in horticulture, grow and flower them with success, year after year. Success in growing the bulbs in pots may be said to depend on several factors—vigor of the bulb; the potting soil, water, plant food, drainage, acid or basic reaction of the potting medium, temperature, light, etc.—any one of which may affect the culture adversely.

The writer has found the following to be an admirable potting soil for hybrid Amaryllis; $\frac{1}{3}$ coarse sand; $\frac{1}{3}$ medium rich garden loam; $\frac{1}{3}$ old, rotted cow manure, well broken up. This mixture should have some ground limestone added if there is cause to believe it is much below neutral in pH reaction. The best available information indicates that a soil pH (reading for acidity and basicity) ranging from 7.0 and 7.4 is satisfactory for hybrid amaryllis. They will tolerate a lower reading, but below 6.0 growers are apt to run into serious difficulties.

The pots should be well drained. At least an inch of coarse gravel or broken crocks should be placed in the bottom of each pot, and a large piece of crock placed over the hole in the first place. The bulb should be planted upright with not more than $\frac{1}{2}$ of its bulk in the soil. In repotting it is possible to raise the bulbs until they are $\frac{2}{3}$ out of the soil, with good results.

Potting is best done while the bulbs are dormant, from October to February. Some bulbs will start into growth at once after repotting, provided the pots are placed in the light and warmth. Others will remain obstinately dormant several months, and may bloom without making leaf or root growth. However, some time in the winter or spring, the bulbs will start to grow, and water should then be given in a judicious and conservative manner.

When the leaves and roots start, the watering can be slightly increased, just enough to keep the soil thoroughly moist, but never enough to make it soggy or sour. The drainage in the pot will help to avoid this condition. During the spring and summer after growth starts, the plants can be fed with weak liquid manure or a teaspoonful of 5-7-5 commercial fertilizer stirred into the topsoil of the pot every three weeks.

If the bulb is vigorous and other conditions are favorable, the plant will produce long leaves in summer which will begin to "ripen off" in Fall, and in warm climates a second growth period sometimes comes in the late Fall months. In the North, the bulbs can be placed outside in the summer, in half shade, sunk in the ground to the rims of the pots, and watered as needed. Aphis, thrips and red spiders are less likely to attack the foliage under outdoor conditions.

When the first cool weather of Fall arrives the bulbs should be brought inside, and two methods of procedure are open to the grower at that time. The bulbs may either be dried off in their pots and stored away with the pots laid on their sides in a warm dry place for the next few months, or they may be kept in the light and warmth, with just enough moisture given them to retain the foliage. In any case, watering should be sparingly done in the winter months of November, December and January.

During January and February the bulbs should be watched carefully for the first signs of growth, and when leaves or a bud appear, the pots should be brought up to the light and warmth ("benched," in greenhouse parlance) and watering started. Some growers recommend repotting at this time provided great care is taken not to injure the principal roots. However, usually it is sufficient to repot every two or three years. On alternate years, some of the top soil should be removed and replaced with fresh compost. In this way the bulb will remain "established" and will bloom at its optimum. It is also recommended to soak the root ball in warm weak manure water when starting the bulbs in the late winter, after the drying off period. This should be continued only long enough to allow the root ball to become thoroughly wet.

The difference between the quality and character of a bloom from an amaryllis bulb that has been established for a year or so is most remarkable to the beginner. Many persons who have never grown the bulbs believe that the first season's flowers, often produced without roots or leaves, are something like normal. As a matter of fact this kind of performance only exhausts the bulb, and makes recovery more difficult for the following year's blooming time.

In other words, thrifty growth following the blooming period is the essential for good flowering results the next season. Under the principles of treatment outlined above, mature bulbs may be retained in prime condition for many years, in fact indefinitely, barring accident.

The "red rust" of amaryllis, is apparently a symptomatic condition, in hybrid amaryllis, and not a disease in itself. It merely signifies that some condition about the bulb is not to its liking. It may indicate sour soil, poor drainage, thrips or other insect injury, etc.

Insect injury is of great importance with hybrid amaryllis. In Florida in the open the large "lubber" Grasshoppers sometimes devour the foliage of Amaryllis bulbs. This cuts down the carbohydrate food supply to the bulb and the bulbs gradually decline unless protective measures are taken. Most growers collect these insects and destroy them, but the easiest method of control might be the use of a lead arsenate spray on the leaves. In the home and greenhouse, thrips sometimes at-

tack the foliage, especially on the under side of the leaves. Red spiders have a similar habit. Soft scales are occasionally found on the leaves and likewise mealy-bugs. These may be controlled by sprays, nicotine compounds, pyrethum, etc., or by a simple wiping of the leaves, top and bottom, occasionally, with a damp cloth.

ALSTROEMERIA CULTURE IN OREGON

DEAN ASPER, *Oregon*

Alstromerias are not common in Oregon, and are known here as Peruvian Lilies. So far as I have been able to ascertain *A. Aurantiaca* and *A. Aurantiaca* var. *lutea* are the only varieties grown commercially. Possibly there are other varieties in private collections.

Culture seemingly is simple here. Beds are prepared with leaf mold and well rotted cow manure and are worked in deeply. Seeds are sown in the beds in September and spaced so that the plants may be grown to flowering size without transplanting. After the plants reach flowering size both the plants and cut flowers are taken from the beds as wanted. As *Alstromeria* increases by underground root stocks and also "self seeds" in the beds, each bed continues to furnish plants for some time. Of course the beds run out in time and new beds are started as needed. I am told that these varieties are hardy here without protection. There is a good demand here for the Alstromerias both as cut flowers and also for the plants, according to the grower from whom I received my information.

NUTRIENT SOLUTIONS WITH SPECIAL REFERENCE TO HYBRID AMARYLLIS

I. W. HEATON, *Florida*

It has been known for over seventy years, that plants obtain the necessary mineral elements for growth from the soil solution, resulting from the solvent action of water upon the soil particles. This is a complex system and only when the various elements are in correct proportion, can maximum growth be obtained. If the balance is changed by leeching or concentration, in the soil of any of the important elements, unfavorable growing conditions result, due to either exhaustion of necessary food elements or concentration and accumulation of injurious salts. It is seldom that ideal conditions can be maintained during a growing season under field conditions.

Various plant physiologists have been avoiding the unknown factors in soil culture by growing plants in solutions of known concentration of mineral elements, either directly in solution or in sand culture (sand moistened with solution). In reality there is little difference between soil and solution culture, except that in the latter, the important factors may be regulated so that more nearly ideal conditions for growth are secured.

Dr. W. F. Gericke of the California Agricultural Experiment Station first developed solution or tank culture on a commercial scale. He was followed later by Mr. R. B. Withrow and Mr. J. P. Biebel of the Purdue University Agriculture Experiment Station, and Mr. J. W. Shive and Mr. W. R. Robbins, of the New Jersey Agriculture Experiment Station. Cornell University also contributed along this line. The Purdue men developed sand culture, while the others worked on nutrient solutions with continuous feeding. According to the California system the plants are grown directly in the solution without support of any kind. Shallow tanks containing the solution are covered with wire netting on which hardwood shavings are placed to hold the plant stems. The roots are free in the solution. While water culture eliminates the labor of watering the plants there is difficulty in maintaining the oxygen and iron supply unless the solution is aerated, as oxygen is only slightly soluble in water. The iron is slowly precipitated from the solution and must be frequently replaced to prevent iron chlorosis. This feature and the difficulty of supplying sufficient oxygen more or less limits tank culture to the experts, who can test exactly the content of each item in the solution. At the same time by this method it is fairly easy to control the concentration of the other food elements, as the solution is not changed by any chemicals which might be in sand or cinders used in the other methods.

Mr. Withrow and Mr. Biebel developed a sand culture method more applicable to control in the hands of the average grower. Under their method the plants are grown in sand and the solution is applied by subirrigation, the surplus draining back to the storage tank to be used again, resulting in considerable savings over the continuous flow method used at Cornell and New Jersey. The method of continuous flow is mainly for experiments in plant nutrition and is not for commercial use. But at the same time this testing by continuous flow will develop the formula we will need for sand culture. Basically all three methods are the same, in that the plant food is dissolved in water and fed as required by the plants.

The sand culture method appears for various reasons the best for hybrid amaryllis, and as the equipment required is the same in all methods, except in the matter of aeration, which can be disregarded in this method, as the sand will contain oxygen in the spaces between the soil particles as soon as the surplus solution has drained away. Further, occasional stirring of the solution before irrigation will carry part of the precipitated iron content with the solution.

The equipment needed consists of a tank at least 8 inches in depth and of a convenient size, with a drainage hole in base, and raised to enable the solution to be drained back into the storage tank. A complete illustration of a sand culture bench will be found in Circular No. 232, Nov. 1937, Purdue University Experiment Station.

As yet there has been no definite work on a special solution formula for hybrid amaryllis, and it will require several years' testing before the best type of solution for this crop will be discovered.

Dr. Ausker E. Hughes, formerly Chemist of the United States department of Agriculture, has suggested the following formula.

(Commercial grades of Fertilizer salts in parts per Million, derived from $\text{CaH}_4(\text{PO}_4\text{O})_2$; 2CaSO_4 ; KNO_3 and $(\text{NH}_4)_2\text{SO}_4$): Nitrogen, 100, 67 parts derived from Potassium Nitrate; Phosphoric Acid, 208; Potash 244; Magnesium Sulphate, 69; Manganese Sulphate, 69; Iron Sulphate, 34; Copper Sulphate, 34; Zinc Sulphate, 17; and Borax, Trace. The above solution when made up will have a low pH value, and will require the addition of Dolomite lime to raise it to a reading of pH7. This will also increase the content of magnesium to some extent.

The excellent results secured in raising seedling amaryllis in flats fed with Nitrophoska No. 5 suggested the following formula,—

Nitrogen, 111; Phosphoric acid, 222; and Potash, 222; with the minor elements as above, and the same treatment for pH. Both of these formulas disagree with those suggested by the experimenters quoted above,—

Mr. Withrow gives the following formula:

Magnesium Sulphate (anhydrous), 1 lb. (2 oz. per M gals.)

Monocalcium Phosphate (food grade) 0-55-0, 2 lbs., 6 oz.

Potassium Nitrate, 13-0-44, 1 lb., 4 oz.

Ammonium Sulphate, 20-0-0, 1 lb., 4 oz.

Calcium Sulphate (agri. gypsum), 13 lbs., 4 oz.

Iron Sulphate, 4 oz.

Manganese Sulphate, $\frac{1}{4}$ oz.

Copper Sulphate, $\frac{1}{8}$ oz.

Zinc Sulphate, $\frac{1}{8}$ oz.

Borax, 3 oz.

Translated into parts per million there we have,—Nitrogen, 50, with 33 parts from ammonium sulphate; Phosphoric acid, 176, and Potash, 235.

In the second formula he increases the Potassium Nitrate to 10 lbs., or 175 parts per million from this salt, and 33 parts from ammonium sulphate reducing the Phosphoric acid to 1 lb., 2 oz., or 80 parts.

There is very little difference in the third formula except a reduction of gypsum. From past experience I feel that Mr. Withrow's solutions are not suitable for amaryllis for the nitrogen-potash ratio is not on a 1 to 2 basis. Commercial acid phosphate, reasonably free from flourine, will supply all the sulphur required, replacing both the Monocalcium Phosphate and gypsum. The latter is not of much value for it is so slightly soluble in water.

Early publication of *Herbertia* makes it impossible to include final results secured from the use of Dr. Hughes's and the Nitrophoska formulas. For an accurate check of both of the solutions and soil culture, two tanks have been planted with two bulbs each of the following varieties of amaryllis; *Dutch Pure White* seedlings, 1" dia.; *Dutch Salmon* seedlings 1" dia.; No. 211, Propagations 2-2½" dia.; No. 1494, 1" dia.; No. 1449, 1¼" dia.; No. 1320, 2" dia.; No. 5110, 1½" dia.; slow growing variety; *Mephisto*, 1½" dia.; No. 156, 1½" dia.; and No. 211, 2" bulbs at 18 months. The tops were trimmed even but the roots were not cut. In 10 days every bulb but the *Salmon* seedlings had produced a

new leaf with an average growth of 3". The color was much improved and a chlorotic condition of the No. 211's had disappeared. Evaporation and transpiration is at the rate of a gal. per week, and this loss of water is replaced with fresh water. The food elements are not depleted except as the bulbs absorb them. The absorbed elements are replaced every thirty days and this on the basis of chemical tests. The free solution is tested by means of colorimetric methods for the various salts, and a sample of the original is saved and labeled for comparison with the thirty day tests, when a lighter color will show the need of additional salts. These are added to the solution, and it is retested until the original color is obtained. In this way the stock solution is not wasted every thirty days, but can be used as long as the tests show the normal concentration of plant food. After a few months the rate of absorption will be evident for each salt and may be easily replaced, with only infrequent chemical tests. From a cost standpoint it appears that sand culture will materially reduce the expense of growing amaryllis. While the original equipment will cost about 2 cents per bulb, the depreciation is small, and great savings will result from the labor items in cultivating and weeding.

Results First Thirty day Period. Total leaf growth of each variety, in inches.

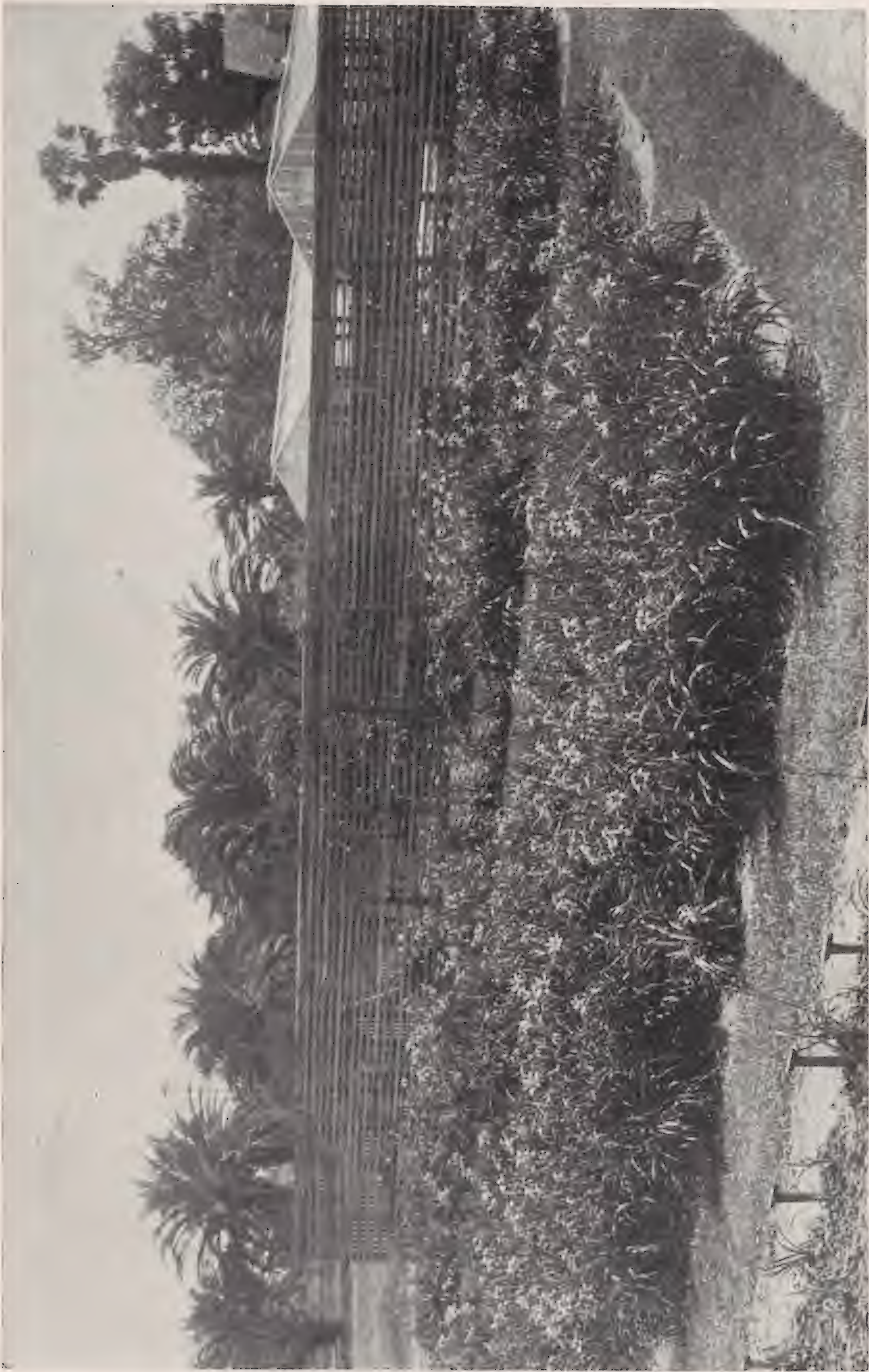
	Tank 1	Tank 2
Bulb—Pure White	32"	41"
Salmon	20"	1"
#211	8"	3"
#1494	12"	13"
#1449	6"	1"
#1330	38"	19"
#5110	16"	21"
#1	22"	25"
#156	26"	17"
#211, 5 bulbs	122"	120"
	<hr/> 302"	<hr/> 261"

Tank No. 1 has produced firmer foliage as well as more growth during the first month.

THE CULTURE OF HYBRID AMARYLLIS

I. W. HEATON, *Florida*

During the past year I have made little change in cultural methods. Barnyard manure has become scarce and I have turned to leaves for a source of humus. This has required the addition of extra lime and I am now using oyster shell. To reduce labor costs and permit more frequent feeding for the past year all of the plant food has been in the form of chemicals applied with the irrigation water. The average feeding is 200 pounds per acre each month of a 10-20-20 chemical fertilizer. The 10-20-20 mixture, applied as above, was also used with fine results on 54,000 seedlings raised in flats. At the rate of 500 seedlings per flat the size was well over 1/2 inch in bulb diameter at the end of nine months.



H. H. Hume

See page 94

Partial view of Daylily Trial Grounds, Florida Agricultural Experiment Station, Gainesville
Plate 115

7. HARVESTING, STORAGE AND FORCING

PERIODICITY, FORCING AND EARLY FLOWERING IN THE AMARYLLIDACEAE

JOHN GRAINGER, *England*

The Amaryllidaceae occupy a place of honour amongst the plants which can delight the eye with fragrant bloom in winter. Such floral amenities are not, however, obtained without horticultural effort, and considerable skill is needed to obtain Christmas bloom from such plants as the Daffodil. The simplest method is to hasten the period of obvious growth of the shoot by temperatures above normal. This is the practice of forcing, but modern research opens the possibility for even greater control of the time of flowering, by the use of further treatment. A proper understanding of the newer methods must be laid upon a knowledge of the periodic development of each species. At present, detailed results are only available, amongst the Amaryllidaceae, for the Daffodil, and to a limited extent, for *Hippeastrum hybridum*.

ORGANIZATION OF THE DAFFODIL BULB

The annual history of the Daffodil has been studied in great detail by Huisman and Hartsema (1933). A bulb of forcing size, lifted at the beginning of May would show, in longitudinal section, a number of scales, representing three or four years' growth, arising from a conical root-plate. No flower bud would then be visible, even by the aid of a strong lens, but a minute bloom will later develop in the centre. Each year's contribution to the bulb is made upon a standard pattern, and for convenience, such an annual increment is shown in Plate 116. Three scale leaves (S) are the first organs to be formed, and encircle the bulb completely except for an opening near the apex. Inside these are three, or possibly four, foliage leaves (Ls), with scale-like bases. The innermost base does not completely surround the bulb, but the others do so, except for the opening near the apex, where the leaf blades emerge. A flower initial (F), and later the bloom, occupies the centre, whilst a bud (Lb) which will make the succeeding year's contribution to the bulb, lies at one side of the flower initial, opposite to the last foliage leaf. Side bulbs arise freely in the Daffodil, and each originates as a bud (Sb) in the axil of a foliage leaf, usually the first. Only one side bud is usually formed in any year's growth; multi-nosed bulbs arise through the adherence of what are functionally separate bulbs, for each "nose" represents about three years' growth.

A bulb of forcing size has usually two active annual increments, surrounded by the brown, shrivelled remains of a third. Each increment is organized in uniform manner, each culminates in a terminal flower, each provides for continuity of growth from a sub-terminal bud, and each allows subsequent vegetative propagation by the formation of a side bud. Development of the scales and foliage always takes one complete year, and the leaves which emerge with a flower commenced their formation twelve months before the bloom initial appeared (Fig. 34). When the

requisite number of vegetative primordia have been laid down, that is, when three scales and three foliage leaves have been formed in miniature, flower formation commences, usually in the month of May. The growing-point in the centre of the bulb then passes through the stages described in Plate 117, until every organ of the future flower is complete in miniature. This stage is reached in Yorkshire about the middle of August (Grainger 1935) and in Holland at the end of July (Huisman and Hartsema 1933). Formation of the flower bud is made at the expense of food stored in the scales; the bulb is living upon its capital, and though it appears inactive, growth is really vigorous within. The

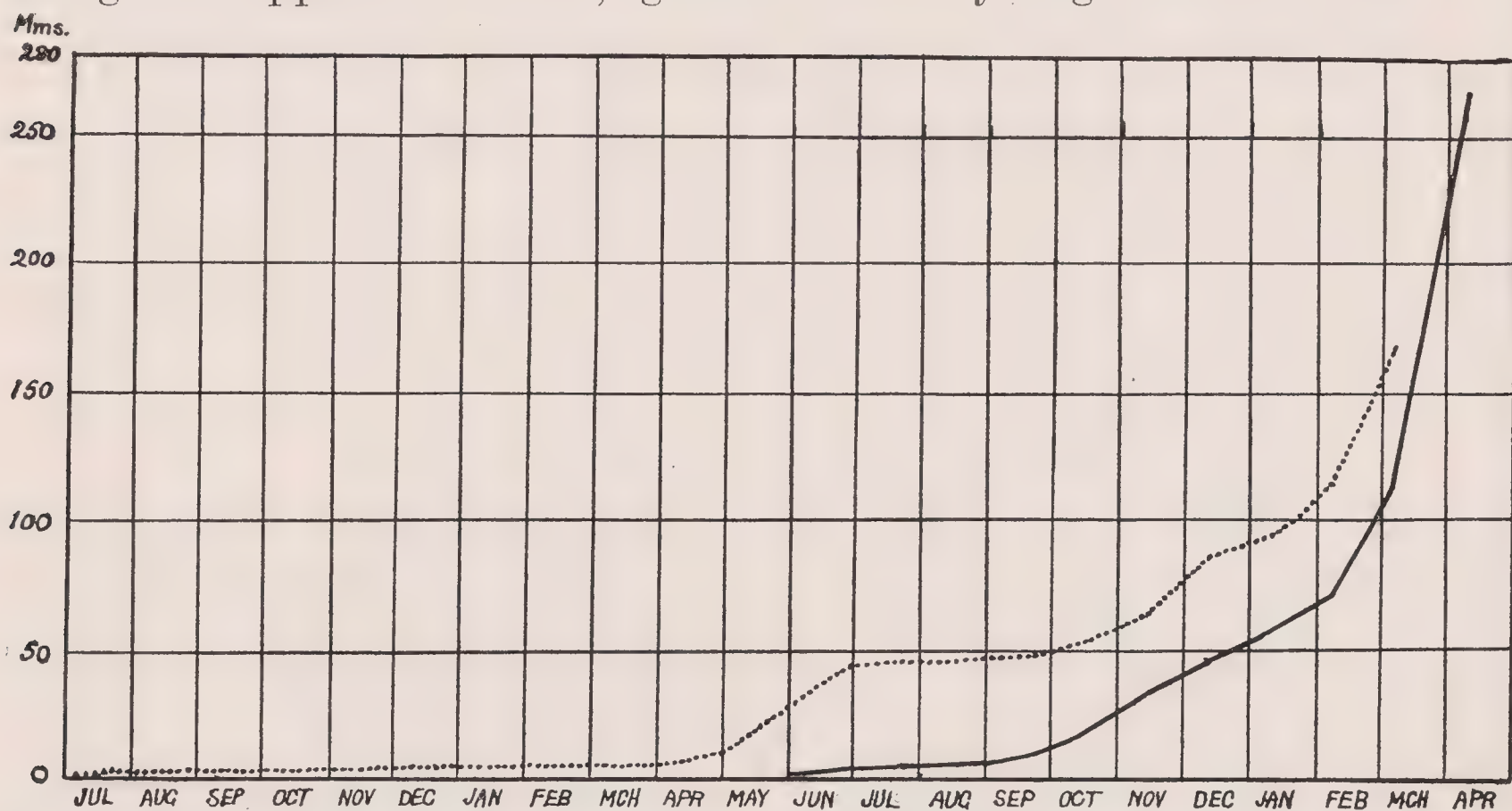


FIG. 34. The relative rates of formation of the leaves (...) and the flower (—) of a Daffodil bulb (From data of Huisman and Hartsema 1933).

attainment of a bloom bud complete in miniature marks the beginning of a period of rest, when the bulb is really quiescent. This rest period may last for five or six weeks, and upon its completion the bulb sends forth roots, the shoot growing point continues its work, and from this time until the flower emerges, growth is maintained steadily. There are thus two periods of growth, separated by a rest period.

THE PRACTICE OF NORMAL FORCING

It is a matter of common horticultural experience that the second period of growth can be hastened or forced by temperatures warmer than normal. The natural blooming time of the *Narcissus* is in April, but flowers can be obtained at the end of December by forcing treatment only. Bulbs are lifted from the field about mid-July, after the foliage has withered. The *Poeticus* division of *Narcissi* should, however, be lifted somewhat earlier. Bulbs of this class have a very short rest period, and begin to root soon after the foliage has yellowed. The time of lifting must be so arranged so that new roots are not broken, for most bulbs cannot increase the number of their water-absorbing root tips by branching, and every broken root is a curtailment of the essential water supply.

Lifted bulbs should be dried, but care must be taken to avoid strong sunlight, which may cause a breakdown of the tissues. Severe breakdown may even endanger the growing point, whilst partial damage always diminishes the available supply of food stored within the bulb scales. Shelters for bulb drying should be provided. These may be either well-ventilated rooms, or sheds with open sides. The bulbs should be packed in single layers within shallow boxes which can be stacked like potato sprouting boxes.

Daffodil bulbs for forcing are usually potted or boxed at the beginning of September. The pots or boxes are placed close together in a cool situation, and are then covered to a depth of about 6 inches by soil, sand or fine ashes. This treatment is known as "plunging," and provides the requisite cool temperature for the rest period. Any other cool environment, such as an unheated cellar, would serve the same purpose. The rest period will probably extend to the early part of October, when roots begin to form, and the bulb becomes firmly anchored in the soil. The pots or boxes may then be brought into a cool greenhouse, and later into increasing temperatures, as mentioned below. Growth takes place steadily, and culminates with the appearance of the flower at Christmas or in January.

Temperatures are important during the time of leaf extension and blooming—the "stretching period" of the Dutch investigators. The best conditions appear to be provided by a temperature of 9°C. (48°F.) until the shoot is about 3 cms. long; then 17°C. (63°F.) until the leaves are 6 cms. long, when a temperature of 20°C. (68°F.) will bring about flowering in the shortest time (Blaauw, Hartsema and Huisman 1932). It has also been established (Grainger and Crawshaw, 1938) that a temperature of 75°F., applied from above the plants by electric lamp-type heaters when flower buds are visible, will hasten their bursting by 10 to 14 days, when compared with a normal greenhouse temperature of 65°F.

PRINCIPLES AND PRACTICE FOR EARLY FLOWERING

Hastening the period of shoot growth is the usual conception of forcing, but a similar treatment with temperatures warmer than normal could also be applied to the flower-forming growth which precedes the rest period, and when combined with further treatment to shorten the time of rest, would make it possible to have blooms at a very early date. This line of argument, portrayed in Plate 118, has been abundantly proved by experiment, though many necessary horticultural details still require elucidation.

The writer obtained Daffodil blooms on November 25th, 1931 (Grainger 1935). Bulbs were lifted on May 19th. from a Yorkshire field, and were stored in an incubator at a temperature of 75°F., until the flower initials were complete. This happened in the early part of August instead of later in the month, as under natural conditions. A period of about three weeks was thus saved from the yearly schedule. The causes and physiology of a rest period are not yet understood, but it is known that cool temperatures or treatment with certain chemicals can, in general, be used to shorten it. An ice-box, maintained at a tempera-

ture of approximately 45°F. was used to this end, and after four weeks' treatment, roots began to appear. The bulbs were then potted, and taken to progressively warmer houses, until they produce a satisfactory quota of very decorative, if somewhat small, flowers well before the end of November. This was, however, regarded more as a demonstration of botanical principles than as a successful horticultural practice, and for suitable cultural details, the work of van Slogteren (1933, 1935, 1936) must be consulted.

It is, in the first place, difficult to apply the necessary temperatures to hasten flower formation, unless the bulbs are lifted from the field. The usual time of lifting in Holland is mid-July, and there is considerable evidence to show that lifting before the normal time is correlated with the small size of the resulting flowers (van Slogteren 1933). Growers are thus left with the two alternatives:—1. to grow bulbs destined for forcing in such a position that the soil can be warmed artificially, or 2. to lift at the normal time, without any hastening of flower bud formation, and then subject the bulbs to a cool temperature, until they are ready for extension growth. The latter treatment appears to be the more successful in practice, and several kinds of *Narcissi*, lifted in mid-July, stored at 48°F. until the end of October, and then brought into forcing temperatures, have flowered before the end of November (van

Plate 116.—Diagrams of the yearly addition to a narcissus bulb, in optical plan, A, and longitudinal section, B. A bulb of forcing size contains two or three such contributions. Three scales (S) without foliage leaves are formed on the outside, then three scales (Ls) with leaf blades, shown by the break-lines at the tips in B. All the scales and leaf bases except the innermost one (Ls' in A) encircle the bulb completely at the base (see A), but a small opening near the tip (indicated in B) allows the leaf blades to emerge. The flower (F) is visible in the centre, and the bud (Lb) at the side opposite the last foliage leaf, is already forming the next annual increment. It should be mentioned that although the diagrams show the organs added to the bulb each year, the full development of the scales and leaves has occupied nearly two years (see Fig. 34), for the bud Lb grows very slowly during the time when the leaves (Ls) and flower (F) extend and appear above ground. A bud (Sb) arises in the axil of the first foliage leaf, and forms a side bulb, which will form about two annual increments of scales and leaves before making a flower. The position of the previous year's flower stalk (F's) is shown to orientate the other parts; F becomes F's in the succeeding year, Lb becomes the next annual contribution, whilst Sb proceeds to form another "nose" to the bulb, and ultimately separates from its "parent."

See text on page 177.

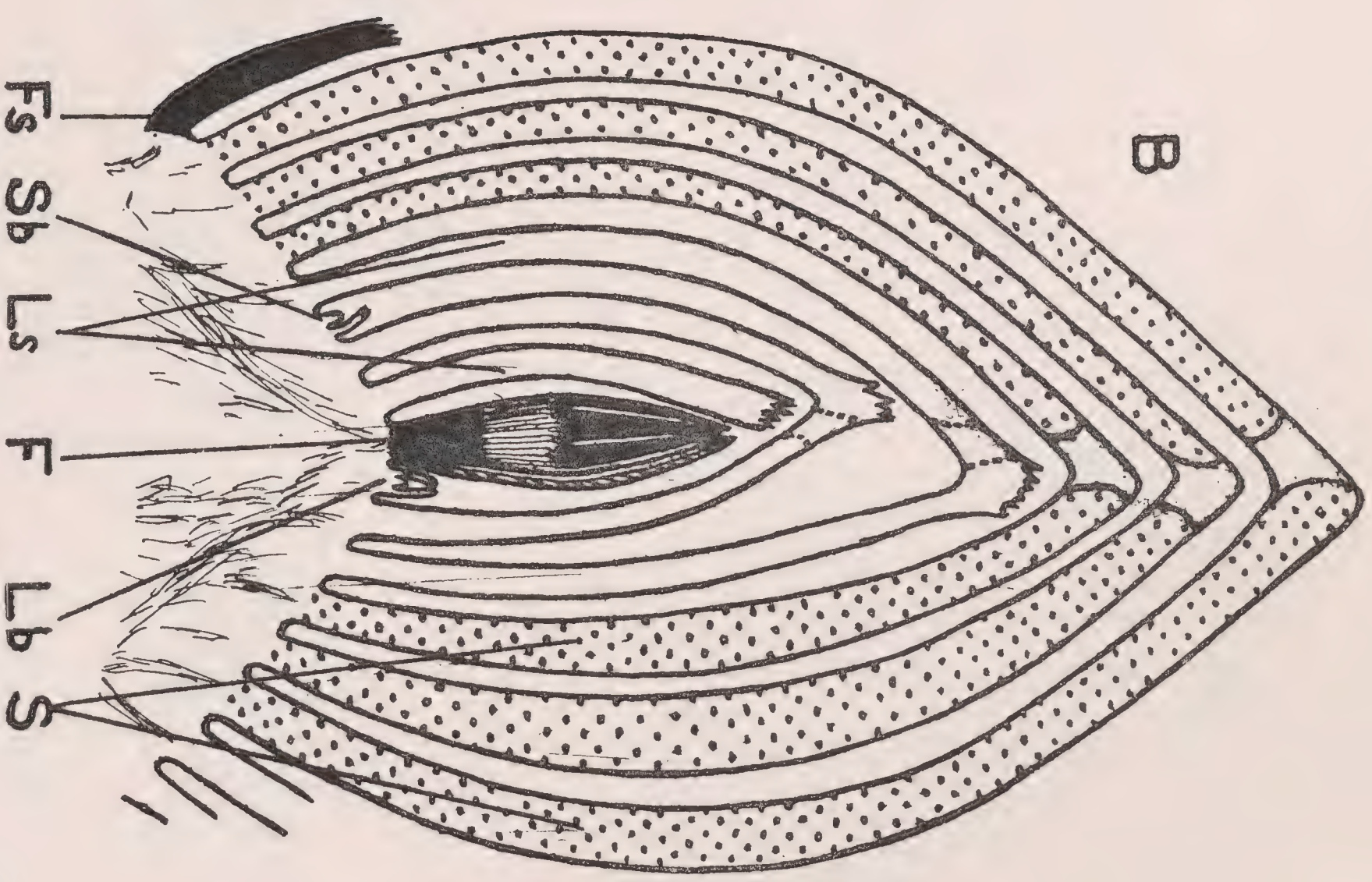
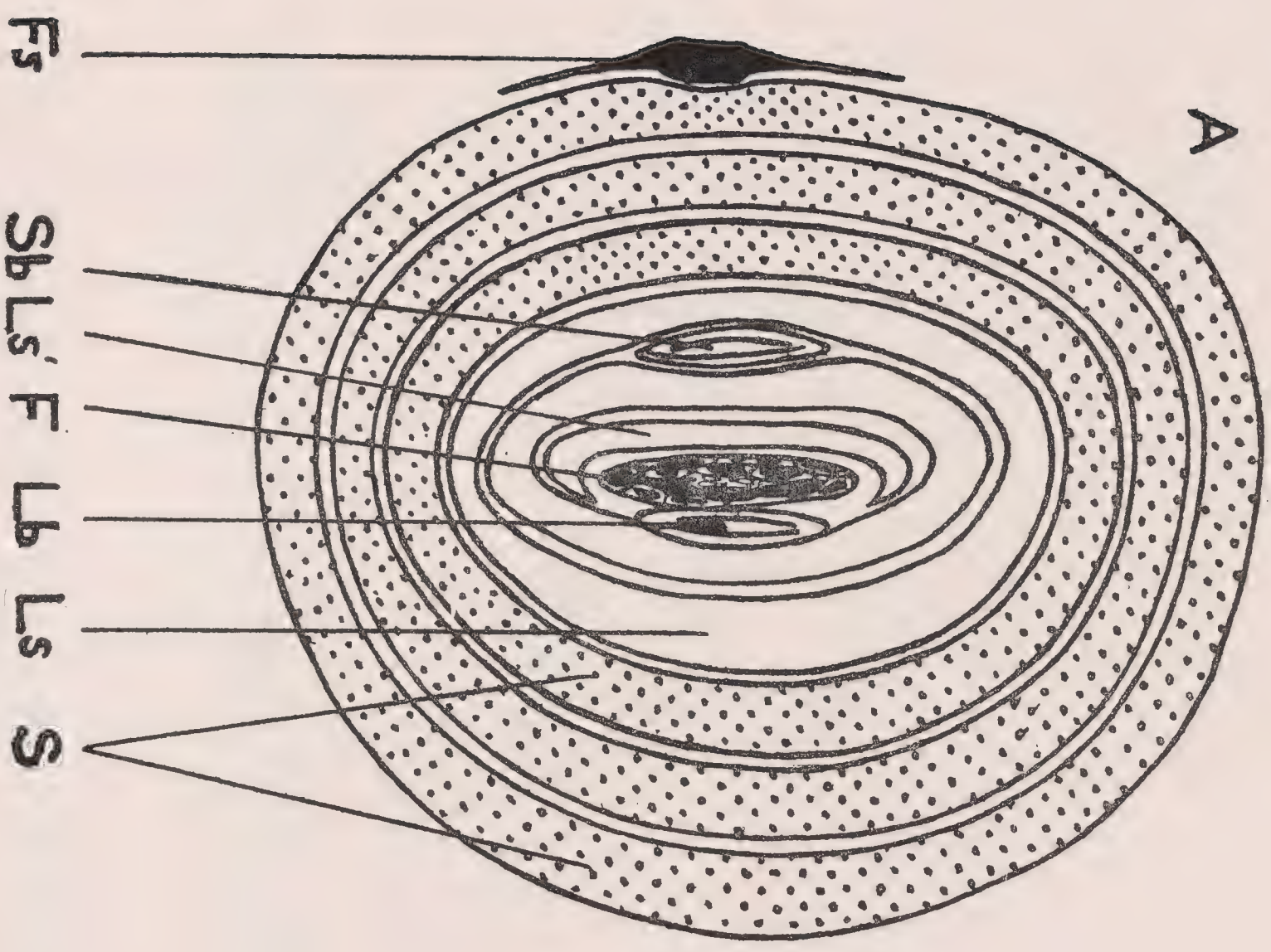
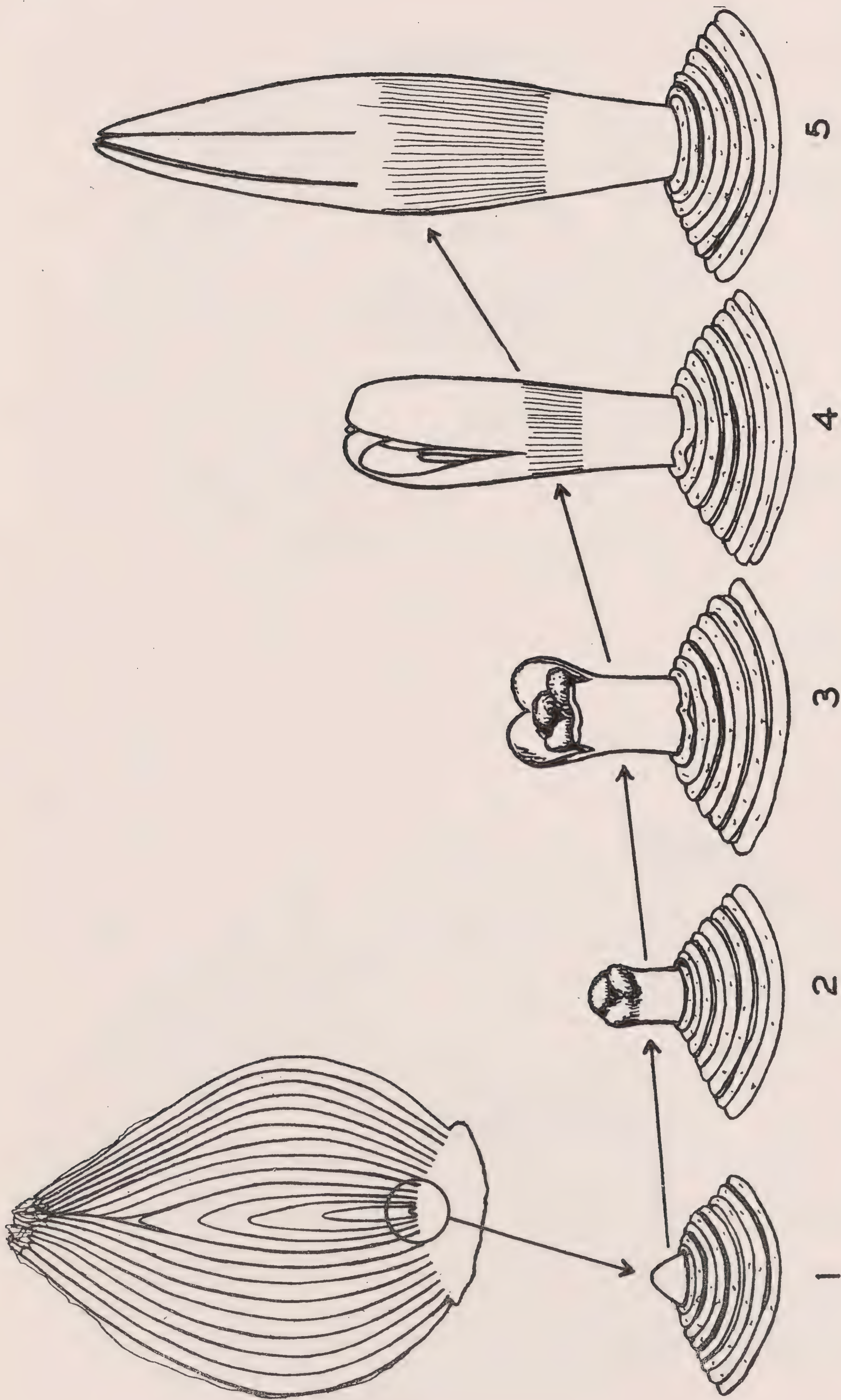


Diagram of the yearly addition to a narcissus bulb. See legend on opposite page, and page 177
Plate 116



Development of the young flower in the narcissus bulb (Growing-point diagrams magnified 12 diameters; bulb diameter $\frac{3}{4}$ natural size). See legend on opposite page, and page 178.
Plate 117

Slogteren 1933, 1935). Several experiments have shown that storage at 68°F. for two weeks immediately after lifting in July, is sometimes beneficial, and doubtless this marks the completion of the flower-forming period. Gerritsen and van der Kloot (1936) give the optimum temperatures for this stage as 68°F. falling regularly to 63°F.

The early forcer should have control of his bulbs at all stages. Daffodil bulbs do not lend themselves to early-flowering treatment before entering the devious channels of commerce. Bulbs stored at 48°F. should not be exposed to a higher temperature before they are forced into growth, and this fact alone makes it difficult to market refrigerated bulbs. It also appears that places with a relatively warm climate in mid-July are not so naturally suitable for the production of early daffodil blooms as cooler districts, unless artificial storage is adopted. One noteworthy feature of the results of van Slogteren is the relatively short period of actual forcing. Bulbs may be stored at 48°F., from mid-July until the first week in November, and still flower before the end of that month. Such a long period of refrigeration represents not only the rest period, but also the first period of forcing at a cool temperature. Bulbs are apparently stored without planting until mid-September, when boxing takes place, and further refrigeration is accomplished in this condition. Van Slogteren gives the following temperatures as optimal for the Daffodil:—

	July	Aug.	Sept.	Oct.	Nov.
For early forcing	62–64°F.	46–48°F.	46–48°F.	46–48°F.	46–48°F.
For later forcing	62°F.	62°F.	59°F.	48°F.	48°F.

Plate 117.—Development of the young flower in a narcissus bulb. At the beginning of May, the growing-point in the centre of the bulb is very minute and roughly conical in shape (1). A side bud which would later grow into the next year's shoot (Lb in Fig. 1) forms about this time, but for the sake of clarity, neither this bud nor the floral bract (spathe) is shown in this series of diagrams. The growing-point elongates, and then three low projections appear (2). These are the initials for the outer perianth lobes, and they are quickly followed by three more, the inner perianth lobes, within the first series, and alternating with them (3). The front outermost lobe is broken in (3) to show the alternating initials within. Diagram 4 represents a stage when the stamens have appeared, and the ovary is being laid down, whilst (5) represents the flower complete in miniature. The trumpet would be laid down at this time; it arises as a ring of tissue around the stamens. This stage is reached in Yorkshire at the middle or end of August, and somewhat earlier in Holland.

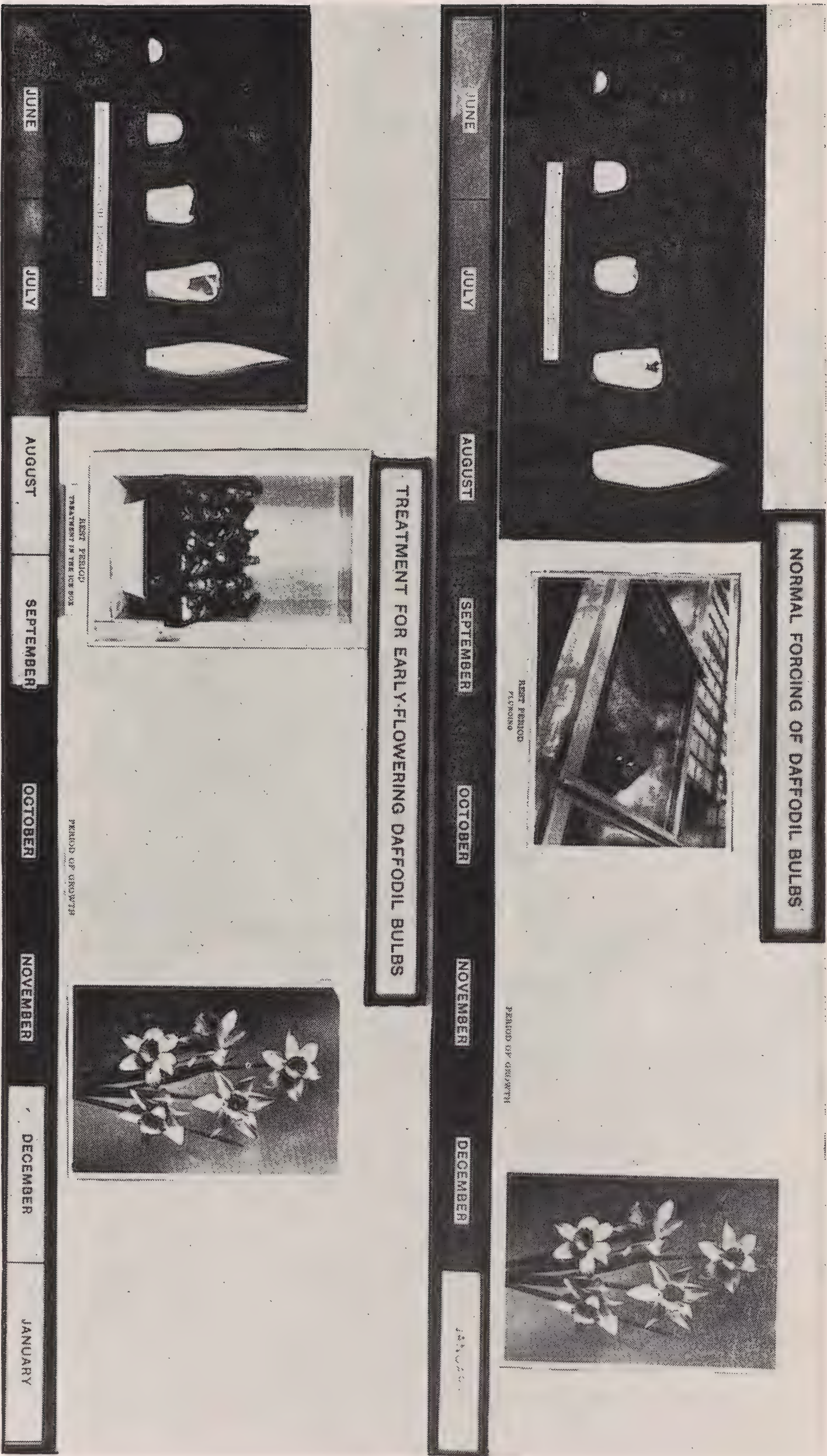
Growing-point diagrams magnified 12 diameters; bulb diagram $\frac{3}{4}$ natural size. See text on page 178.

It would seem necessary, moreover, to work out details of culture for different geographical regions. Conditions in Yorkshire vary considerably from those in Holland, though a qualitative similarity is always detectable. The completion of flower formation, for instance, is later in Yorkshire by three or four weeks, and it is perhaps significant that the artificial hastening of flower formation in early-lifted bulbs was by no means such a complete failure as van Slogteren reports for Holland. It is possible that the methods which yield such excellent results in the hands of Professor van Slogteren and his colleagues at Lisse, Holland, could not be applied to other localities without modification in detail. The principles of treatment are, however, firmly established, and it is now incumbent upon experimenters in other regions to adapt them to local conditions. A time of minimal floral beauty can be embellished by an *Amaryllid*, but the process requires the executive skill of the gardener to be coupled with the exactitude of a scientist, for it is important to control temperatures and other treatments exactly.

The periodicity of *Narcissus* is broadly similar to that of the *Hyacinth* and *Tulip*, but several important differences occur in detail (Gerritsen and van der Kloot, 1936; Mulder and Luyten, 1928). Practical details for early flowering are by no means interchangeable in the three kinds of bulb. An interesting problem connected with the ripening of *Narcissus* bulbs relates to their transport to the southern hemisphere. A bulb has thereby to withstand a journey across the equator, and has further to adapt itself to a different time of flowering, namely August instead of April. Such a change in the periodicity is accomplished by keeping the bulbs at the relatively higher temperature of 28°C. (81½°F.), with a humidity of approximately 70%, from the time of lifting, until the end of the following February, when they are sent to the southern hemisphere (Hartsema and Blaauw, 1935).

PERIODICITY OF *HIPPEASTRUM HYBRIDUM*

Periodic development in *Hippeastrum* has been studied by Blaauw (1931). The foliage leaves begin to appear about December or January, and continue to grow in regular succession until the following September, under Dutch conditions. Leaf formation is then arrested, and the main period of flowering usually takes its place. Flower buds appear to be formed fairly regularly every fourth leaf, and there may be as many as six flower buds, the result of two seasons' growth, when vegetative growth is arrested in the autumn. Two or three of these will flower at the main time of blooming (1, 2 and 3 in Plate 119); the others (4, 5 and 6) wait until the following year before they emerge. It should therefore be the care of the gardener to nourish the plants during one season for the blooms they are to produce in the next. If only two buds are ready to emerge at the flowering period, the second will bloom two or three weeks after the first, but if a third bud is capable of development, an interval of two months or more will separate it from the second. It is thus possible for the gardener to ensure a greater and more extended succession of bloom by arranging for the production of three flower buds in each year. The sooner leaf growth can be made to commence in De-



The principles for normal forcing of Daffodils (above) and for early flowering (below).

Normal forcing: Flower formation under natural conditions, completed towards the end of August, then rest period under relatively cool conditions of "plunging" under ashes within an open garden frame until mid-October, followed by period of growth and flowering at the end of December.

Early flowering: Flower formation hastened by a temperature warmer than normal, completed in early August; rest period shortened by treatment in an ice-box, followed by period of growth and flowering at the end of November.

Part of a specialist exhibit made by the writer for the Yorkshire Museums Federation.

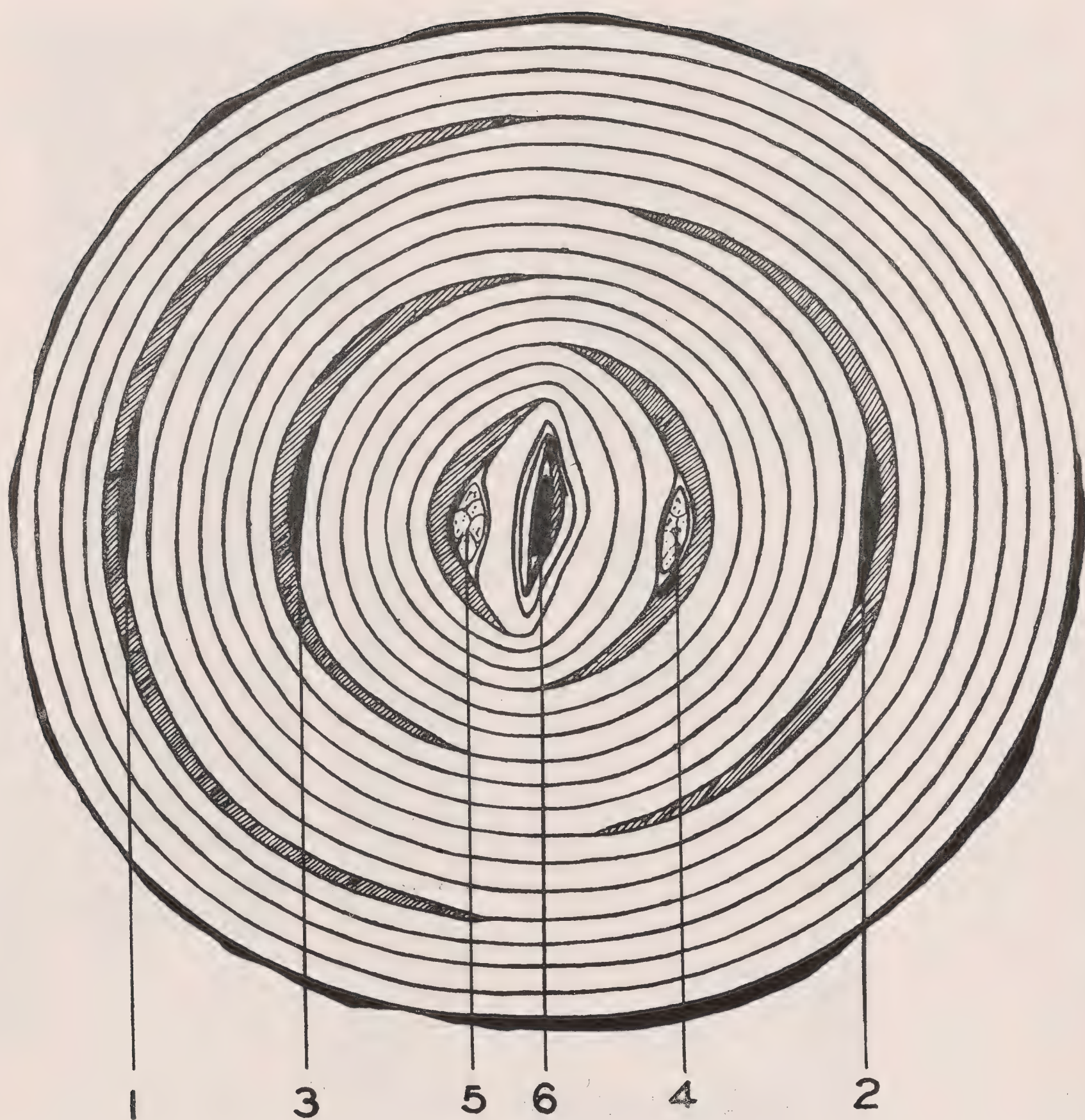


Diagram of a bulb of Hippeastrum hybridum, as seen in plan, showing six inflorescence initials.

Approximately two years' growth is represented by the bulb. The inflorescence buds arise in the axils of every fourth scale (shaded in the diagram, and not encircling the bulb completely as do the three preceding scales). Bloom buds 1, 2 and 3 are represented by the lower part of the stalk, as the plane of section passes below the inflorescences. These buds will bloom in one flowering period; buds 4, 5 and 6 will emerge a year later. It is possible for a bulb of two seasons' growth to have only four bloom buds; such a state of affairs could be visualised from the diagram if the central bloom bud (No. 6) and the outermost (No. 1), with all scales external to the latter, were omitted. Two inflorescences would then appear at one flowering period, and two a year later. An interval of about two weeks would separate the pair of blooms in each season, whereas if three were available at each flowering period, the first and second would be separated by about 14 days, and the second and third by two months.

Modified from Blaauw. (1931). (See pages 184 and 187.)

cember, by the provision of more water or otherwise, and the longer it can be maintained in the autumn, the more chance is there for the appearance of the twelfth leaf of the season, with its concomitant third flower bud (i. e. No. 6 in Plate 119). Cessation of growth in autumn is often assisted by dry conditions, though this is not always so.

Horticulture is a skilful craft, an ancient art, and a developing science, which can give great reward for knowledge. The more exact control of plants made possible by modern investigations not only enhances man's diet, both quantitatively and qualitatively, but also gives that most desirable of assets: increased floral beauty.

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THE EARLY FORCING OF DAFFODILS

PROF. DR. E. VAN SLOGTEREN, *Director of the Laboratory
for Flowerbulb-Research at Lisse, Netherlands*

After the early crocus the daffodils give color to our bulb fields, depending on the weather conditions of the preceding winter and early spring, and the fields become yellow in different shades beginning about the 15th of March or the first of April. The first hyacinth blooms follow about a fortnight later and they again are succeeded by the brilliant colors of the tulips.

Until about eight years ago the succession of flowers and colors in our glass-houses, on our flower markets and at our exhibitions was quite different from the sequence observed in the bulb fields.

In December the prepared hyacinths and a few tulips came first, succeeded by more hyacinths and tulips and with only a few exceptions we were not able to bring the daffodils into bloom before the second half of January. Most of the daffodils arrived after the first of February.

How can this discrepancy in precocity of the flowers on the fields and in the forcing-houses be explained? The bulb growers certainly had done everything that seemed possible to bring all kinds of bulb-flowers on the early market, but all methods, applied successfully to the other flower-bulbs to influence favorably the precocity of the flowers, practically failed with the daffodils.

The first attempts to force bulbous plants into flower were made by the Dutch bulb growers themselves before any official scientist had given any attention to the problem. The principle of "preparing" the flower-bulbs for early forcing was discovered by the Dutch bulb-grower, Nicolaas Dames, more than thirty years ago. He was the first to apply jarovisation or vernalisation to bulbous plants. Various methods of preparing flower-bulbs for early forcing have been applied.

(a) The bulbs may be planted in a milder climate, where they can flower earlier, can be lifted earlier, and thus gain somewhat in precocity as compared with the bulbs grown in our climate.

(b) The bulbs may be planted in glass-houses and thus giving them an artificial climate, which also makes them flower earlier and better fitted for early forcing.

(c) The bulbs may be planted in the open above heating tubes or electric cables buried in the soil. In this case the bulbs have all the advantages of the growing conditions in the open, and this is desirable for the production of proper sized bulbs, and in addition to this, during the last weeks of the growing season, before the lifting, the ripening of the bulbs in the soil and flower formation can be favorably influenced by a higher soil temperature than that provided by the natural climate.

The object of these three methods is to correct, during the growing period of the bulbs, adverse influences of the natural climate on the forcing capacity of the bulbs for the next season. It was the ingenious idea of Nicolaas Dames to improve the forcing capacity of his hyacinths by lifting them prematurely and by ripening them under artificial conditions instead of depending on the whims of the natural climate. Through a great number of experiments he succeeded in bringing hyacinths into bloom about four weeks earlier, lengthening in this way the period of sale for his products by about a month.

To make clear why this method did not give any satisfaction for daffodils, I am obliged to point out in brief some differences between the flower formation and development in hyacinths, tulips and daffodils. My explanations are based on the climatic conditions and the experiences in our climate. Later on we shall be able to secure an idea of the significance of these facts for other regions, where daffodils are grown.

The formation of the flower for the next season in hyacinths normally starts in July. By prematurely lifting the bulbs in June and applying different storage temperatures, the normal formation of the leaves in the bud for the next season can be stopped, and the formation of the



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Upper, *Narcissus Golden Spur*, both boxes lifted June 16; No. 176 kept for 2 weeks at 62.5 degrees F.; No. 168 at 48 degrees F., until forcing, Nov. 25.

Lower, *Narcissus Mignon*; No. 1285 lifted June 27; No. 1298 July 15; both kept at 48 degrees F., until forcing, Nov. 28.



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Left, *Narcissus Brilliancy*; lifted July 15, Planted Sept. 13 at 48 degrees F.; in glass-house Nov. 7; in flower Nov. 28.

Right, *Narcissus Early Surprise*; lifted July 16; stored 2 weeks at 62 degrees F.; in glass-house Dec. 1; in flower Dec. 14; photo Dec. 21.
Plate 121

flower initiated. In this way to a certain extent it is possible to start the formation of the flower of the hyacinth when it seems desirable.

With tulips, lifting and storing at a higher temperature does not determine the beginning of the flower formation as with the hyacinths, but here the completion of the leaves first has to take place.

A great number of experiments, first by the bulb growers themselves, later on by Blaauw and his cooperators, by Beyer, and the writer in our laboratory for flower-bulb research at Lisse, have been concerned with the optimum storage conditions for influencing the formation and further development of the flower, and the forcing capacity of hyacinths and tulips.

Hyacinths and tulips are lifted in June and July, depending on the varieties and the desire to improve the forcing capacity. The premature lifting of tulip bulbs sooner leads to deterioration of flower quality than similar treatment of hyacinths. Most of the tulips are lifted in July, before the formation of the flower inside the bulb has begun. In the case of daffodils, however, the formation of the flower already starts in the beginning of May, about two and half months before the bulbs can be lifted. At lifting time the formation of the flower is practically ended and after lifting only extension growth takes place.

Premature lifting of daffodil bulbs very soon leads to excessive dwarfing of the flowers for the next season and mostly spoils the crop. For this reason the period of flower formation cannot be influenced artificially and this depends entirely on the natural climatic conditions of the district where the bulbs are grown. Most important for the forcing capacity of the daffodils is the fact that optimum storage temperatures for early forcing of the lifted bulbs are much lower than for the hyacinths and tulips, and even lower than the normal average temperature of our climate. The method applied most successfully for hyacinths and tulips, the applying of an artificial climate during flower formation in the bulb, therefore cannot be used for daffodils.

The three methods mentioned, planting in another climate, in glass-houses, or on top of heating units in the soil, are also of much less importance for daffodils since the optimum temperature for flower formation is so much lower than for hyacinths and tulips that the soil temperature may easily be made too high for the optimum development of the flower. Planting in a milder climate can make them bloom much earlier than in our regions, but the early summer following the spring here is mostly very hot and has a retarding influence and therefore the advantage attained during the winter, is again lost.

At present, after our investigations and experiments of the last ten years, we know that by treating daffodils as we did formerly, we only made them less fit for early forcing. (See Plates 120, 121, 122, and 123.) Generally we can say that daffodils lifted in our region, must be stored at a temperature of 46° to 48° F., while the average outside temperature in our country in July and August is about 65° F.

The growers had already found out by experience that storage indoors together with hyacinths and tulips retarded the flowering still more. By leaving them out-of-doors in the field the greatest precocity was

attained, but this still excluded the possibility of forcing them before the second half of January or later. Now after lifting we put them in refrigerated storage of about 46°-48°F., when we wish to have them as early as possible. For a somewhat later date we prefer to keep them at 62°F. during July and August and at 59°F. during September.

Griffiths complained about excessive dwarfing when he stored the bulbs immediately after lifting at 48°F. This may be due to the fact that the period of storage is too long when the bulbs are lifted earlier than takes place in this country. The stage of development of the flower, too, due to climatic influences, may not be far enough advanced at lifting time when they have been grown in a warmer climate and in this case I should certainly prefer to store the bulbs at about 62°F. until the second half of July or about the first of August.

In Table 1 the average monthly day temperatures together with the optimum temperatures for early and later forcing of daffodils under our climatic conditions, are indicated for a number of locations. With us, as I have stated before, flower formation has normally been completed when we store the bulbs at 46°-48°F. For other climatic conditions than in Holland one has to keep in mind that for early forcing it does not seem necessary to bring most of the varieties into cold storage (46°-48°F.) before the first of August.

TABLE 1.
Average monthly day temperatures, degrees Centigrade (Means for 24 hours)

	July	Aug.	Sept.	Oct.	Nov.	Dec.
De Bilt, Netherlands	16.8	16.6	13.8	9.6	5.0	2.6
New York City, U. S. A.	23.1	22.3	19.2	13.1	6.7	1.3
Washington, D. C., U. S. A.	24.9	23.6	20.1	13.6	7.2	2.3
St. Louis, Mo., U. S. A.	26.2	25.2	21.1	14.7	6.3	1.9
Chicago, Ill., U. S. A.	22.4	21.8	18.1	11.7	3.9	-1.5
Portland, Ore., U. S. A.	19.8	18.8	15.9	11.8	7.6	5.2
Los Angeles, Calif., U. S. A.	19.7	20.3	19.2	16.8	14.6	12.9
Greenwich, England	17.1	16.7	14.2	10.0	6.7	4.7
Optimum temperature for <i>early</i> forcing of daffodils	17.0	8.0	8.0	8.0	8.0	
	to	to	to	to	to	
	17.9	9.0	9.0	9.0	9.0	
Optimum temperature for <i>later</i> forcing of daffodils	17.0	17.0	15.0	9.0	9.0	

When the bulbs are lifted one has to investigate the stage of development of the flower-bud inside the bulb. If all the parts of the flower have not yet been formed it is advisable, to store the bulbs at a temperature of about 62°-65°F. When all parts have been formed and only extension-growth is still necessary, the bulbs can be stored at a lower temperature as mentioned above. (46°-48°F.). By following this procedure we have demonstrated that the period of sale for daffodils can be lengthened 4 to 6 weeks. Many varieties can be had easily by about the 15th. of December, and not less important from an economic point of view is the fact that the period of forcing in glass-houses has been shortened considerably at the same time.



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Left, Narcissus Incomparabilis Helios; lifted July 18; stored at 48 degrees F.; planted Sept. 15 at 48 degrees F.; in glass-house Nov. 18; in flower Dec. 5; photo Dec. 14.

Right, Narcissus Orange Glow; stored at 48 degrees F. from Aug. 2; planted Sept. 22 at 48 degrees F.; in glass-house Nov. 11; in flower Dec. 19.



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Upper, Poetaz Narcissus White's Hybrid; lifted July 15; stored at 48 degrees F.; planted Sept. 15 in boxes outdoors; in glass-house Nov. 30; in flower Dec. 17; photo Dec. 24.

Lower, Narcissus Spring Glory; effect of glass-house culture (645); soil-heating (650); and field culture (657).

Plate 123

The new methods of treating daffodils have given both agreeable surprises as well as disappointments with reference to the response of different varieties to this treatment. Some varieties, like *Croesus* and *Bernardino* have lost a part of their popularity. One of our most beautiful varieties however, Mrs. E. H. Krelage, Plate 95, formerly seemed of no use for early forcing and was considered to be one of the latest of our daffodils. It responds however very well to cold storage and now gives a great number of flowers of excellent quality early in January.

It is clear that for optimum results with early forcing, the potting of daffodils has to take place at a low temperature, preferably not higher than 46°-48°F. The bulbs must not be planted before the soil temperature is sufficiently low.

It is possible to keep the bulbs dry in storage at 46°-48°F. until the end of September or the beginning of October, if the root development is kept back sufficiently by regulating the moisture in the storage room. If the soil temperature is too high and root growth is too rapid, the bulbs can be planted in pots or boxes that can be stored indoors at 46°-48°F. In this case great care must be taken that the boxes are sufficiently watered during this period.

Varieties which make roots easily later in the season, like *Sir Watkin* or *Helios*, may be kept dry at 46°-48°F. until rather late in the season, (we have kept them like this until October 16th, and had them in flower on Dec. 22), before planting them out of doors. At this date the soil temperature is usually low enough, certainly it is in our climate. Other varieties, like *Poeticus ornatus*, which do not make roots well enough if planted late, are better planted early under artificial temperature control.

When the bulbs have to be shipped one also has to take into account the possibility of climatic conditions before, during or after the voyage, influencing fitness for early forcing. Practically throughout the whole northern hemisphere where daffodils are forced, the high temperatures of July or August absolutely ruin the capacity of daffodils for early forcing. The forwarding of the bulbs in most cases should be delayed until the climatic conditions are more favorable.

Formerly we needed from 4 to 6 weeks forcing at 65°F. or higher to secure the blooms by February 1-15th. Now, at a temperature of 60°F., we bring a great number of varieties in bloom in about 10 to 20 days. We prefer not to force them at a higher temperature. If one is in doubt about the right date of setting them in the forcing house, it is advisable to start forcing at 55°F. When the foliage starts to grow and the flower-buds appear outside the bulb, the temperature can be raised to 60°F. or a little higher. If growth stops and the flower-stalks do not grow, it is very dangerous to raise the forcing temperature. In most cases this indicates that the potted bulbs have been brought into the glass-house too early and it is better to drop the temperature. If too much harm has not already been done, one should start forcing again in about one to two weeks later at 60°F.

One has to keep in mind that the morphological development and the size of the flower-bud are not always a reliable criterion as to the early

forcing capacity of any particular variety. A somewhat higher storage temperature in July and August may be more favorable for the extension growth of the flower-bud in some cases. Other bulbs, stored at a lower temperature, may show smaller flower-buds and therefore less advanced extension growth, yet the latter may flower about a month earlier than the former. This indicates that other factors also determine the fitness for early forcing and for this reason in our laboratory we have studied the biochemical processes that take place in the bulbs during storage. The carbohydrate metabolism is largely influenced by the storage temperature and we are studying this side of the problem to secure a better insight into the physiological processes that take place in the bulbs.

SUMMARY

The formation of the flower of daffodils begins much earlier than with other flower-bulbs and may start about two and a half months before the bulbs can be lifted. The optimum temperature of this development of the flower in the bulb before it is lifted is rather low.

If the flower has been completely formed at lifting time the bulbs can be stored at 46°-48°F. If necessary a short period at about 62°F. may be advisable, until all parts of the flower are completed.

In a very early climate there may be danger of too long cooling. Starting at 46°-48°F. at the end of July is sufficient for early forcing. Preferably bulbs should not be planted before the soil temperature has dropped to 46°-48°F.

By applying these methods daffodil flowers can be had about 4 to 6 weeks earlier than heretofore in excellent quality, and the period of forcing can be cut down to about half the time formerly needed.

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8. THE SOCIETY'S PROGRESS*

THE SECRETARY'S MAIL BAG

Mr. Edward Steichen, Ridgefield, Conn., writes that he "had a grand time" during a three months trip through Yucatan and Southern Mexico early in 1938. "We saw in various places what looked like a double flowered Amaryllis. As might be expected, it wasn't very attractive, but seemed quite common," he adds. Mr. Steichen had a fine color photograph of *Hemerocallis* in the March 1938 issue of the "Ladies Home Journal."

Major Albert Pam of Wormley Bury, Herts., England, corresponding member of the A. A. S., had the pleasure of having a photograph of his greenhouse full of flowering plants of *Pamianthe peruviana*, that interesting winter-flowering amaryllid which was named after him, published in an issue of the *Gardeners Chronicle* (London) early in 1938 (March 12, page 175).

Dr. Harper Goodspeed, Professor of Botany and Director of the University of California Botanical Garden, has promised to share with the American Amaryllis Society any amaryllids collected during his projected plant exploration trip to Western South America during 1938-39. This exploration trip has the sponsorship of the California Garden Clubs, Inc. In 1937 Dr. Goodspeed arranged the importation of some 15,000 bulbs of the interesting *Leucocoryne ixioides*, "Glory of the Sun," illustrated in the 1936 "Herbertia," in order to find varietal types having greater vigor, different colors, etc.

Mr. Harry L. Stinson of Seattle, Wash., delivered a series of popular lectures on "Fundamentals of Botany" on the Civic Center Spring Program, of his City, during January, February and March. Mr. Stinson is a pioneer amaryllid enthusiast of the Northwest and is a charter member of the Society.

Dr. J. C. Th. Uphof, Professor of Botany at Rollins College, Winter Park, Florida, who contributes the notable article to this issue of *Herbertia* which relegates the Herbertian genus *Hippeastrum* to limbo (few will regret this) is the author of many distinguished monographs and scientific articles in the field of botany, biology and plant genetics. His work includes the latest revision of the *Sarraceniaceae* for the *Pflanzenfamilien*, Vol. 17b.

Perhaps the most interesting feature of the 1938 Southeastern Regional Amaryllis Show of the A. A. S., in Orlando, March 23-24, was the display of the light rose and pink- and white types of hybrid amaryl-

*Information in this section was prepared by Mr. Wyndham Hayward, Secretary of the Society.—Ed.

lis entered as a non-competitive exhibition jointly by Dr. H. P. Traub and Dr. A. E. Hughes. It was a revelation of the lightening effects of the use of pollen from the best near-white on the darker bulbs.

The months that Dr. A. E. Hughes served as executive secretary of the American Amaryllis Society were sufficient for him to leave an excellent record of service and cultural proficiency and efficiency. His culture of amaryllids, (he is a soil chemist by training) proved the most successful in an intensive way ever seen in Florida, without fear of contradiction. Our best wishes and those of all his friends in the Society go out to Dr. Hughes in his new position and we are grateful to him for his zeal and enthusiasm during a period of overwhelming activity.

Regarding some red-flowered *Cyrtanthus* bulbs which he donated to the A. A. S. Trial Collection, Mr. W. E. Rice of Downey, Calif., writes, "This is a very pretty thing; it will grow quite readily if given an abundance of water as long as it will grow. Full sized bulbs are about as large as *Zephyranthes*." Mr. Rice writes that he grows thousands of *Hippeastrums*, *Chlidanthus*, *Lycoris*, *Sprekelias*, etc. The *Cyrtanthus* proves to be well worth growing, and may be offered to A. A. S. members next season.

"We have already worked in reds, pinks, etc., for about 20 years, and we *ought* to have the best possible to obtain," Dr. A. B. Stout of the New York Botanical Garden advises in describing his researches in the new shades of *Hemerocallis*. All Daylily enthusiasts who can make the trip to New York are urged to visit the display gardens of the New York B. G. at Bronx Park in season, and see the wonderful new variations being evolved in the red and pink daylilies through the use of *Hemerocallis fulva rosea*, etc.

Daylily breeding is recommended without reserve for those real plantsmen who like to see something new develop from their own handiwork. All that is needed is a collection of the leading named varieties, and a few of the outstanding species and their varieties, for the amateur plant lover to create at least a few new things of value. The breeding of daylilies is still in its infancy and the possibility for variation is million-fold in the shades of yellow, orange, bronze, fulvous, pink, rose and red. Some time there may come a pure white one. Seedlings *can* be bloomed in less than a year in Florida or twenty to twenty-two months on an average.

"President Roosevelt," the Leopoldi type hybrid amaryllis introduced by I. W. Heaton in 1934 remains the outstanding named variety of this class in common cultivation today. In the writer's own experience it has almost all the desirable qualities, good shape, good color, fine texture, vigor of growth, ease of propagation, proved quality as a pollen and seed parent. Its rich red-orange flower with the startlingly white center is easily recognized by one who has once seen it, even after a year or two.

Pure white hybrid amaryllis are still the most sought-after color and the most scarce of all types. The pure white bulbs do not have the vigor of the colored types for very successful vegetative propagation on a large scale, and they grow slowly even under good cultivation. They take a year or two to become well established in pots, and resent disturbances severely. It is hoped that by widespread sowing of white seedlings under outdoor conditions, a strain can be developed which will breed reasonably true to color and type from seed, and which will produce an occasional bulb of sufficient vigor and vitality to make the vegetative propagation of pure white named varieties easy.

The writer takes this occasion to call attention to a previously unknown or unnoticed hybrid *Crinum* variety, which is hereby termed *Rawlinsii* for purposes of identification. This variety was donated to the A. A. S. Trial Collection by Mrs. Rawlins of Orland, Calif. The flower is of the *Powellii* type and may be a sister hybrid of some of the known *Powellii* varieties. However, the flower is darker rose-purple than any known *Powellii* variety, almost a wine color. It is several shades darker than *Cecil Houdyshel*. The form of the bulb, flower, foliage, scape, etc., is like *Powellii*, but smaller. The A. A. S. will have several bulbs of this for distribution in another season.

Mr. Frank Vasku of Winter Park has been the object of much horticultural visiting since he imported a dozen bulbs of the genuine *Amaryllis* (formerly *Hippeastrum*) *procera* (the "Blue *Amaryllis*") from Petropolis, Brazil, during spring, 1938. Mr. Vasku made the necessary commercial contacts on his own initiative through a missionary and deserves high commendation for his enterprise in making this first recorded introduction of the bulbs into the United States in many years. The picture of one of the bulbs (Plate 112) appearing elsewhere in this "Herbertia" speaks more than words can tell. It is a preposterously large amaryllis bulb, three feet long, and definitely not an epiphyte as previous sources had indicated. We predict that greenhouses and lath-houses will grow them by the dozens when the secrets of their culture are solved. A lavender-blue flowered amaryllis is about all that has been lacking short of a yellow one.

The American *Amaryllis* Society still stands in need of a few sizable donations for extra-*Herbertia* publications, as monographs, texts, etc., and for additional black and white and color plates for the Year Book. Grateful recognition of all special donations for whatever purpose will be accorded.

The Society acknowledges with appreciation the donation, received in 1937, of \$50.00 from Maj. George Churcher, English plant fancier and gladiolus specialist in addition to his interest in *Amaryllis*, toward the extra burden of expense sustained by the Society in publishing the double issue of the 1937 *Herbertia*.

Ft. Lauderdale, Florida, on the lower East Coast of the state, will be a center for amaryllid pilgrimages when Mr. R. H. Gore, the new executive secretary of the A. A. S. makes further headway with his collection of rare *Amaryllis*, *Clivias*, *Nerines*, *Crinums*, etc. Mr. Gore entered upon the cultivation of the amaryllids with a sincere and serious purpose, to provide Fort Lauderdale and Southern Florida with an outstanding collection of plants and bulbs of this group. From personal contact we know Mr. Gore to be a man of resolution and perseverance, and we feel safe in predicting great things for his gardens next to where the Gulf Stream rolls.

Won't the members of the American Amaryllis Society continue to consider the work of the Society and its welfare, *their* particular interest? If you like our Year Books, tell us so. If you have suggestions for its improvement, or ideas for publication or research within our field, let us know. The officers are always glad to have letters from members and readers in all parts of the world. It is this friendly, living, cooperative spirit which compensates for the many hours spent in official service.

The exhibit of a color photograph by Mr. Edward Steichen of New York and Ridgefield, Conn., attracted much attention at the 1938 Southeastern Regional Amaryllis show in Orlando, Fla. This photograph is of large size and was donated to the American Amaryllis Society especially by Mr. Steichen for reproduction in "Herbertia" when sufficient funds for the color printing plates may be available. Contributions toward this end will be welcomed. The picture shows a light type of flower of very pleasing shape and form. At the Orlando exhibition it rivaled the living flowers for popular interest.

"Gardening Illustrated" for March 5, 1938 shows a photograph of the flower, *Amaryllis* (*Hippeastrum*) *Edward Cartwright*, a magnificent variety with large, soft red flowers, shown by Mr. R. F. W. Cartwright, which received an Award of Merit from the Royal Horticultural Society in London at the R. H. S. Fortnightly Show, February 22-23.

Mr. Arthington Worsley, amaryllid specialist of Ventnor, Isle of Wight, England, author of the William Herbert biography in the 1937 "Herbertia," described a species novum (new species) of *Gladiolus*, *G. tardus*, December-flowering, in an early issue of the *Gardener's Chronicle* (England) this year (1938).

Sr. Joao Dierberger, of Sao Paulo, Brazil, corresponding member, writes that he believes he has discovered the genuine *Amaryllis* (*Hippeastrum*) *rutilum* var. *citrinum*, the rare yellow flowered amaryllis, lost for a century. We hope he sends the Society some seeds or bulbs as soon as possible!

Clivias seem to be coming in for greater popularity in Europe and America. The German horticultural papers are full of advertisements of seeds and plants of *Clivia* hybrids in the spring, and in America Mr. E. P. Zimmerman sends us a series of remarkable photographs of his lath houses of the plants in bloom. Mr. Cecil Houdyshel is also making Clivias an important specialty of his bulb business.

From Mr. John V. Watkins of the University of Florida, College of Agriculture, comes the comforting information that the clone of *Hemerocallis fulva* var. *rosea* (recently named *Rosalind* by Dr. Stout), greatest desideratum and most promising plant for the hybridizer, is at last finding its way into normal nursery channels, and in a few years should be available to the garden public at a reasonable price. He writes: “. . . *H. fulva rosea* bloomed for the first time in our garden (University of Florida) on May 6, 1934, having been received from the NYBG earlier in the year. Now there is enough stock for our needs and we have exchanged several divisions for new hybrids of northern plantsmen.”

This note will serve to publish a new variety of *Sprekelia formosissima*, the same being var. *Superba*, referring to a distinct and superior type of this interesting species, donated to the Trial Collection garden (A-76) of the American Amaryllis Society by Mrs. Emma Foster of Covina, Calif. This variety has lighter red flowers, larger and more vigorous than the ordinary *Sprekelia*, and is noteworthy for its light throat, which is usually quite dark in the ordinary species. Mrs. Foster's bulb so far as known is of unknown origin, but in cultivation for some time. It is possible that it may be a hybrid of some sort, since it refuses resolutely to set seed, to its own or any other pollen. The bulb is typically *Sprekelia*, but larger than usual. It multiplies by offsets.

SECRETARY'S MESSAGE

“Superlative” has been the word covering the worldwide impressions of the 1937 *Herbertia* which have appeared in print in numerous horticultural trade, scientific and general publications since that outstanding issue came off the press.

Scarcely a letter has reached the secretary's office this last year without some mention of wonder and praise at the prodigious work accomplished and the marvelous result attained in the compilation of that volume. Appreciation unstinted and unreservedly deserved has been accorded with wide acclaim to its editor, Dr. Hamilton P. Traub of Orlando.

Exercising the secretarial prerogative, while we cannot induce the printer, over the editor's head, to insert an electro of the editor's happy countenance, we nevertheless yield to the temptation to quote from two sources, with reference to the 1937 Year Book,—

First, from “Horticulture,” December 1, 1937, page 486:

“It would be too much of a task to give anything like an adequate review of this annual, but those who are interested in the Amaryllis and

allied plants will doubtless spend much time with it. I take off my hat to the hard-working editor, Hamilton P. Traub of Orlando, Fla., for the excellent job which he has done."

We take off our own hat to the editor, and have done it conscientiously for several years with ever increasing wonder and admiration at his editorial powers of enthusiasm, perseverance and "punishment."

The second, in a letter from Mr. Edward Steichen, President of the American Delphinium Society, and eminent New York photographer, now of Ridgefield, Conn., dated April 23, 1938:

"Your Year Book is a very impressive job. The amount of conscientious work involved takes on heroic proportions."

The above says it better than many lines of the present writer.

And now to the busy year since the 1937 Year Book went to press:

It has been a fleeting period, with all the joys and trials of plant enthusiasm, research, breeding and cultural problems. There have been interesting and substantial additions to the Trial Collections garden of the American Amaryllis Society, and the Society has grown in membership and importance internationally.

The 1938 Year Book, in its way will match the greatness of the last number. Mr. Ernst Krelage is a worthy successor to Dean Herbert in the annals of amaryllis lore. The name of Krelage will always be large in the records of amaryllid culture. His enthusiasm has also spread to other fields, as witness his service of a quarter of a century to the Dutch Bulb Growers Association. And yet he has retained an active interest in all the amaryllids as a whole, and from time to time, in the European horticultural press, there have appeared his comments and impressions on various subjects.

The Society records with regret the untimely resignation, and with pleasure the loyal service rendered by Dr. A. E. Hughes, formerly of Orlando and now of Detroit, Mich., as Executive Secretary during 1937 and 1938. Without his helpful cooperation the work of the Society and the conduct of its 1938 Regional Amaryllis Show in Orlando, Fla., would have been most difficult.

The officers announce with this issue of *Herbertia* the appointment of Mr. R. H. Gore, of Ft. Lauderdale, Florida, as successor to Dr. Hughes as Executive Secretary of the Society. Mr. Gore is a business man of Illinois and Florida who has now made the latter state his permanent home, and is building a collection of tropical plants and bulbs, specializing in the Amaryllis Family, (hybrid amaryllis, Clivias, Nerines, etc.) His collection will be outstanding in the Southeast and perhaps the whole country. His other interests in horticulture have encompassed daylilies and irises on a large scale in the North.

As a hotel owner in Ft. Lauderdale, Mr. Gore is planning to institute the first "Amaryllis Room" in any hostelry in the country, with murals and decorations of live plants in season. The Society is to be congratulated on acquiring the cooperation of a man of the experience and good business sense and genuine plantsman's enthusiasm of Mr. Gore.

The Secretary still insists that every member consider himself or herself a committee of one on the welfare of the Society, and spread the gospel of Amaryllis to the extent of one or two new members every year. Application blanks and other information will be supplied gladly. Our membership is still far short of financial security. Your continued co-operation in the sending of your dues with all promptness, and the obtaining of new members, and the donation of special contributions for general support of the Society and *Herbertia*, will save your editor and the other officers many gray hairs.

—WYNDHAM HAYWARD,
Secretary.

*Lakemont Gardens,
Winter Park, Florida, U.S.A.,
April 30, 1938.*

NOTICE OF 1939 NOMINATIONS

To the members of the American Amaryllis Society:

As provided by Article 5, Section 1, of the By-Laws of the American Amaryllis Society, which specifies that the secretary shall send to all voting members, not less than 90 days before the date of the annual election, a list of the offices to be filled and the names of those whose terms expire, this information is hereby incorporated in the data below, and same will take the place of a mailed notice to the members to this effect for the 1939 election:—

President	Mr. E. G. Duckworth
Vice Presidents	Mr. T. H. Everett, <i>New York, N. Y.</i>
	Mr. E. A. McIlhenny, <i>Avery Island, La.</i>
	Mr. Fred H. Howard, <i>Montebello, Calif.</i>
Secretary	Mr. Wyndham Hayward
Executive Secretary	Mr. R. H. Gore
Treasurer	Mr. R. W. Wheeler
Director-at-large for 3 years	Dr. Hamilton P. Traub

Article 7, Section 1 of the Constitution, provides that any voting member may submit to the Secretary, not less than sixty days before the annual meeting, nominations for officers and directors. These shall be submitted to a nominating committee, who shall select the candidates for the final ballot.

The Annual Meeting of the Society in 1939 will be held on the second Wednesday in April, as provided by Article 10, Section 1, of the Constitution, this being April 12, 1939. Therefore the names of nominees must be submitted by the voting members to the Secretary before February 12, 1939.

WYNDHAM HAYWARD,
Secretary.

June 8, 1938,
Winter Park, Florida.

The Secretary would like to take this opportunity of calling to the attention of members again the desirability of adding new members and enlarging the field of the Society by bringing it to the attention of horticulturists and garden lovers everywhere. The 1938 Year Book, we hope, will be considered a notable example of the Society's constant efforts to bring together the latest research, the newest accurate and useful information and interesting illustrations concerning the important amaryllis family. The income of your Society is used solely for the publishing of its Year Book, the holding of Amaryllis exhibitions, and generally supporting the other worthy aims of the organization.

REPORT OF TRIAL COLLECTIONS COMMITTEE

The Trial Collections Committee reports herewith the receipt of bulbs, plants or seeds of various Amaryllids since the publication of the report in 1937 *Herbertia*:

A-211—*Hosta* species, probably including *undulata media picta*, *coerulea* and *subcordata grandiflora*, from John F. Ruckman, Doylestown, Pa.

A-212—Seed pods of *Pamianthe peruviana*, from Maj. A. Pam, London, Eng.

A-213—Seeds of *Crinum Forbesianum*, from Mrs. Jerome W. Coombs, of Scarsdale, N. Y.

A-214—Small bulbs of *Elisena longipetala* x *Hymenocallis Calathina* hybrids (*Hymenocallis festalis* in the trade) from Al. G. Ulrich, St. Louis, Missouri.

A-215—*Pyrolirion aurea*, bulbs from Atkins Institution of Harvard University at Cienfuegos, Cuba.

A-216—*Zephyranthes tubispatha*—bulb from Mrs. W. D. Diddell, Jacksonville, Fla.

A-217—*Z. tubispatha*—bulbs from Dr. H. Harold Hume, Gainesville, Fla.

A-218—*Leptochiton quitoensis*, seeds from Maj. A. Pam, London, England.

A-219—Seeds of *Ixiolirion Pallasi* and *I. Ledebouri*, from John Ruckman, Doylestown, Pa.

A-220—Bulbs of Garfield hybrid *Amaryllis*, Nos. 13 and 30; from Garfield Park Conservatory, Chicago, Ill.

A-221—Bulbs of *Cyrtanthus flammea*, from John R. Heist, St. Augustine, Fla.

A-222—*Ammocharis falcata* seeds, from Maj. A. Pam, London, Eng.

A-223—*Pancratium* species, possibly *maritimum*, seeds from E. N. Blake, Laredo, Texas.

A-224—*Crinum pedunculata*, seeds, from Al. G. Ulrich, St. Louis, Mo.

A-225—*Habranthus texana* from W. Hayward.

A-226—*Alstroemeria nemorosa*, seeds from Maj. A. Pam, London, Eng.

A-227—*Bomarea campaniflora*, seeds from Maj. Pam.

A-228—*Cyrtanthus lutescens*, seeds from Maj. Pam.

A-229—*Zephyranthes macrosyphon*, seeds from Maj. Pam.

A-230—*Zephyranthes Ajax*, seeds, from Maj. Pam.

A-231—*Zephyranthes mesochloa*, seeds from Maj. Pam.

A-232—*Crinum longifolium*, from Maj. Pam.

A-233—*Hymenocallis galvestonensis*, bulbs from Cecil Houdyshel.

A-234—*Hymenocallis Amancaes*, bulbs from U. S. Dept of Agriculture P. I. No. 93769.

A-235—Seeds of supposed *Hippeastrum-Vallota* cross, from Dean Asper, Troutdale, Ore.

A-236—*Alstroemeria aurantiaca var lutea*, seeds and tubers from H. L. Stinson, Seattle, Wash.

- A-237—*Alstroemeria chilensis*—seeds and tubers from Mr. Stinson.
 A-238—*Hemerocallis*, plants of unknown variety from Mrs. J. H. Churchwell, Jacksonville, Fla.
 A-239—*Haemanthus species*, seed from Maj. A. Pam.
 A-240—*Cyrtanthus species*, bulbs from W. E. Rice, Downey, Calif.
 A-241—*Crinum pedunculata*, seedling from Al. G. Ulrich, St. Louis, Mo.
 A-242—*Crinum yemense*, bulb from Mr. Ulrich.
 A-243—*Crinum Abyssinicum*, bulb from Mr. Ulrich.
 A-244-A-255 from Dr. A. B. Stout, Curator of Education and Laboratories, New York Botanical Garden, New York, N. Y.
 A-244 Linda *Hemerocallis*.
 A-245 Circe *Hemerocallis*.
 A-246 *Hemerocallis fulva rosea* (Rosalind).
 A-247 *Hemerocallis Thunbergii* No. 1.
 A-248 *Hemerocallis citrina* 7-10.
 A-249 *Hemerocallis fulva maculata*.
 A-250 *Hemerocallis multiflora* No. 2.
 A-251 *Hemerocallis exaltata*, Series 1692, No. 19. (a seedling)
 A-252 *Hemerocallis Minor* No. 3.
 A-253 *Hemerocallis DuMortierii* No. 2.
 A-254 *Hemerocallis gracilis* No. 3.
 A-255 *Hemerocallis aurantiaca* No. 1.

(Continued from page 96.)

We wish to report that the new name, of the former "Verbandszeitung Deutscher Blumengeschaeftsinhaber," is "Deutsche Blumenbinderei." This is a weekly periodical.

Febr. 14, 1938
 Berlin-Lichterf.-West,
 Unter den Linden 58
 Berlin

Deutsche Blumenbinderei
 TSCHUKE, Editor

(Continued from page 156.)

mature *Clivia* plant will make from ten to twenty new roots each spring and each one is a possible new plant.

These excised new roots are planted in three-inch pots and are handled just like seedling plants. They require from six to eight weeks to form new top growth. This forms at the junction of stem and root, and for the first season may be crooked, but it will be straight by autumn.

Judgement is required in watering and a potting soil with extra good drainage is needed. The new plants will out grow a seedling of the same age, and the mother plant flowers regularly and makes still more seeds, thus doing double duty.

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1938-39

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* This committee makes recommendations to the Board of Directors for the annual award of the *George Yeld Memorial Medal*.

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Mr. Leonard H. Vaughan;

Mr. R. W. Wheeler;

Mr. E. G. Duckworth;

Mr. Edward Steichen.

PUBLICATIONS OF THE AMERICAN AMARYLLIS SOCIETY

A complete file of HERBERTIA, the year book of the American Amaryllis Society, is indispensable to all who are interested in amaryllids. A limited number of copies of the following are still available:—

Volume 1 (1934). Containing the biography of Henry Nehrling, and many valuable articles on amaryllids; with a portrait of Henry Nehrling and 16 other illustrations; a total of 101 pages.

Volume 2 (1935). Containing the autobiography of Theodore L. Mead, and many excellent articles on varieties, breeding, propagation, and culture of amaryllids; with portraits of Theodore L. Mead and David Griffith and 18 other illustrations; a total of 151 pages.

Volume 3 (1936). Containing the autobiography of Arthington Worsley, and important articles on description, genetics and breeding, physiology of reproduction, and amaryllid culture; with 3 portraits of Arthington Worsley, one color plate and 30 other illustrations; a total of 151 pages.

Volume 4 (1937). Containing the biography of William Herbert; the reprint of Herbert's essay, *On Crosses and Hybrid Intermixtures in Vegetables*; Dr. Darlington's essay, *The Early Hybridizers and the Origins of Genetics*, and many important articles on description; cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with two portraits, forty-four other plates and three figures; a total of 280 pages.

(Continued on page 210.)

THE BUYERS' GUIDE

OUR ADVERTISERS—MAY THE TRIBE INCREASE AND PROSPER

CECIL HOUDYSHEL, *California*

There is just one criticism that might possibly be offered regarding *Herbertia's* advertisements—there are not enough of them. This section is one of the most interesting in the book and always leaves the reader with a desire for more.

Firstly, I want to give my personal recommendation for every advertiser here. I have dealt with most of them and know many of them personally. I have found them dependable in their transactions, helpful with advice and information, and more imbued with the love of flowers than concerned with the profits in growing them commercially.

It is an accepted truth that advertising pays, but it is not generally realized that the statement needs amplification to make the meaning clear. The fact is that advertising benefits not only the advertiser, but also the buyers who read the advertisements and through them come into possession of fine stocks of amaryllids, and the latest in gardening necessities and luxuries.

Secondly, I want to say a word about opportunity. If I were to relate the most important events of my life, I would have to include the reading of an advertisement in my mother's flower magazine just forty years ago. Through that avenue I acquired a bulb of *Amaryllis Johnsoni*, and I liked it so much that my destiny was influenced. An avocation was acquired that became most literal in its meaning as it "called me aside" from my profession of teaching.

Opportunity is said to knock only once, but this is an error. The world is full of opportunities, and they beat a regular tat-tat-too on your front door and then go around to your back door and even tap on the window panes. They assail you from all sides. But unprogressive people close eyes and ears to opportunity. One of the most effective ways of doing so is to neglect legitimate and ethical advertising.

Thirdly, *Herbertia*, the annual messenger of inspiration that has revived and enlarged the amaryllid bulb industry in the space of a few years, really merits your consideration. The officers of the Society and the contributors to *Herbertia* have labored faithfully and unselfishly without remuneration, and the commercial growers of amaryllids who are benefitting from the revival of interest in this group of plants can do no less than to support the Society to the extent of taking out advertising space. In this way they are doing their share toward the advancement of the amaryllids while at the same time they are helping themselves.

Finally, I have a word to the buyers. Every amateur grower of amaryllids should be on the mailing list of every advertiser in *Herbertia*. At the expense of a post card you can learn much about culture, available species and hybrids. No matter how exacting your wants may be, you will find sources of supply for many of them, and possibly all of them, in the catalogs and price lists of *Herbertia* advertisers.

Patronizing Herbertia's advertisers, will not only advance all our self-interests in the Amaryllis Family, but indirectly you too are helping to make possible the publication of this book. If you are a lover of amaryllids, or of flowers generally, you will do what you can to make their culture more general. You will appreciate the importance of the cultivation of flowers in the development of cultural tradition, and you will believe that flowers may even be the Envoys of Heaven to Earth.

(Continued from page 208.)

Volume 5 (1938). Containing the autobiography of Ernst H. Krelage; the history of amaryllid culture in Holland by Ernst H. Krelage; Dr. Uphof's important article in which the name *Hippeastrum* is rejected; a revision of the tribes of the Amaryllidaceae; and the genera of Amaryllis; outstanding articles on forcing amaryllids by Dr. Grainger and Prof. Dr. van Slogteren; and many other articles on description, cytology, genetics and breeding; physiology of reproduction, and amaryllid culture; with 33 plates and 2 figures; a total of 218 pages.

The prices of the above described volumes *to non-members* are based on the available supply:

Volume 1, 1934, very scarce, \$3.75 each, postpaid.
 Volume 2, 1935, very scarce, \$3.75 each, postpaid.
 Volume 3, 1936, \$3.25 each, postpaid.
 Volume 4, 1937, (double number), \$4.25 each, postpaid.
 Volume 5, 1938, \$3.25 each, postpaid.

The prices *to members* are \$1.00 less per volume than indicated above.

Herbertia in sets	Price of sets, postpaid	
	to non-members	to Members
Vols. 1, 2, & 3	\$10.00	\$ 9.00
Vols. 1, 2, 3, & 4	\$14.00	\$13.00
Vols. 1, 2, 3, 4, & 5	\$17.00	\$16.00

Make checks payable to the American Amaryllis Society, and send orders to the Secretary,

Mr. Wyndham Hayward,
 Winter Park, Florida.

Agapanthus umbellatus
 Amarcrinum Howardii
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 Clivia miniata
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 Peachblow
 Powelii alba
 Powelii rosea
 Cyrtanthus lutescens
 Eucharis amazonica
 Haemanthus coccineus
 multiflorus
 Hippeastrum equestre
 equestre var. Alberti
 Johnsonii
 Hybridum
 advenum, red
 advenum, pink
 Hymenocallis calathina
 caribaea
 Sulphur Queen
 Leucojum vernum
 Lycoris aurea
 radiata
 squamigera
 Nerine filifolia
 Pancratium illyricum
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St. Augustine - - Florida

Highest Quality

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Budded bulbs from January to May. Produce blooms in two weeks. **Price 50 cents each, \$5.00 per dozen.** Prepaid in lots of 1 dozen or more.

Write for prices on bulbs 2" and up.

HYBRID AMARYLLIS SEEDLINGS

From hand pollenized seeds. **\$2.00 per 100; \$17.00 per 1000.** Prepaid.

Zephyranthes Robusta Bulbs

$\frac{3}{4}$ " and up, per 100, \$3.50

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in six separate colors and shapes;
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Vallota speciosa; Amaryllis (Hip-
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Sulphur Queen; Chlidanthus lute-
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Giant Hybrid Amaryllis

Our strain is generally recognized as one of the finest in America, the result of nearly forty years of consistent line breeding. The flowers are of immense proportions, of model form, with surprising brilliancy and range of color. From the pure white ground colors, with their delicate markings of rose, red, carmine and other tints, to the glorious, dazzling scarlets, crimsons, maroons, rose and bright red self colors, or the innumerable handsomely bi-colored or tri-colored varieties, this strain of Amaryllis leaves little to be desired. The blooms attain an enormous diameter of nine to ten inches and over. The flowers are flat and spreading, with fully rounded, overlapping petals, borne erect on sturdy stems three feet or more in length, displaying the flowers to great advantage.

Large bulbs $2\frac{1}{2}$ to 3 inches in diameter, each 50c; per ten, \$4.50.

Giant bulbs 3 to $3\frac{1}{2}$ inches and up, each, 75c; per ten, \$6.75.

Parcel Post or Express extra.

Address all Orders to Howard & Smith, Montebello, California.



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Our Own Originations and Those of Other Leading Hybridizers as
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Gordon Wayne. Pure white seedling of Virginia Lee, self pollenized. Larger, more vigorous, easier culture, very rapid multiplier. This third generation hybrid produces seed freely and crosses easily with either species or hybrids. \$10.00 each.

See our catalog for fuller descriptions and culture.

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Thousands of *C. miniata*, *C. miniata* hybrids, *C. nobilis* hybrids. Prices on application.

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